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SUMMARY TECHNICAL REPORT
OF THE
NATIONAL DEFENSE RESEARCH COMMITTEE

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PROGRAMS DIVISION (STR ERRATA)
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A master errata sheet will be compiled from these reports and sent to recipients of the volume. Your help will make this book more useful to other readers and will be of great value in preparing any revisions.

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SUMMARY TECHNICAL REPORT OF NDRC

MICROFILM INDEX

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OFFICE OF SCIENTIFIC RESEARCH AND DEVELOPMENT

VANNEVAR BUSH, DIRECTOR

NATIONAL DEFENSE RESEARCH COMMITTEE

JAMES B. CONANT, CHAIRMAN

WASHINGTON, D. C., 1946

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NOTES ON THE ORGANIZATION OF NDRC

The duties of the National Defense Research Committee were (1) to recommend to the Director of OSRD suitable projects and research programs on the instrumentalities of warfare, together with contract facilities for carrying out these projects and programs, and (2) to administer the technical and scientific work of the contracts. More specifically, NDRC functioned by initiating research projects on request from the Army or the Navy, or on requests from an allied government transmitted through the Liaison Office of OSRD, or on its own considered initiative as a result of the experience of its members. Proposals prepared by the Division, Panel, or Committee for research contracts for performance of the work involved in such projects were first reviewed by NDRC, and if approved, recommended to the Director of OSRD. Upon approval of a proposal by the Director, a contract permitting maximum flexibility of scientific effort was arranged. The business aspects of the contract, including such matter as materials, clearances, vouchers, patents, priorities, legal matters, and administration of patent matters were handled by the Executive Secretary of OSRD.

Originally NDRC administered its work through five divisions, each headed by one of the NDRC members. These were:

Division A — Armor and Ordnance
Division B — Bombs, Fuels, Gases, & Chemical Problems
Division C — Communication and Transportation
Division D — Detection, Controls, and Instruments
Division E — Patents and Inventions

In a reorganization in the fall of 1942, twenty-three administrative divisions, panels, or committees were created, each with a chief selected on the basis of his outstanding work in the particular field. The NDRC members then became a reviewing and advisory group to the Director of OSRD. The final organization was as follows:

Division 1 — Ballistic Research
Division 2 — Effects of Impact and Explosion
Division 3 — Rocket Ordnance
Division 4 — Ordnance Accessories
Division 5 — New Missiles
Division 6 — Sub-Surface Warfare
Division 7 — Fire Control
Division 8 — Explosives
Division 9 — Chemistry
Division 10 — Absorbents and Aerosols
Division 11 — Chemical Engineering
Division 12 — Transportation
Division 13 — Electrical Communication
Division 14 — Radar
Division 15 — Radio Coordination
Division 16 — Optics and Camouflage
Division 17 — Physics
Division 18 — War Metallurgy
Division 19 — Miscellaneous
Applied Mathematics Panel
Applied Psychology Panel
Committee on Propagation
Tropical Deterioration Administrative Committee

NDRC FOREWORD

AS EVENTS of the years preceding 1940 revealed more and more clearly the seriousness of the world situation, many scientists in this country came to realize the need of organizing scientific research for service in a national emergency. Recommendations which they made to the White House were given careful and sympathetic attention, and as a result the National Defense Research Committee (NDRC) was formed by Executive Order of the President in the summer of 1940. The members of NDRC, appointed by the President, were instructed to supplement the work of the Army and the Navy in the development of the instrumentalities of war. A year later, upon the establishment of the Office of Scientific Research and Development (OSRD), NDRC became one of its units.

The Summary Technical Report of NDRC is a conscientious effort on the part of NDRC to summarize and evaluate its work and to present it in a useful and permanent form. It comprises sixty-eight volumes broken into groups corresponding to the NDRC Divisions, Panels, and Committees.

The Summary Technical Report of each Division, Panel, or Committee is an integral survey of the work of that group. The first volume of each group's report contains a summary of the report, stating the problems presented and the philosophy of attacking them, and summarizing the results of the research, development, and training activities undertaken. Some volumes may be "state of the art" treatises covering subjects to which various research groups have contributed information. Others may contain descriptions of devices developed in the laboratories.

Some of the NDRC-sponsored researches which had been declassified by the end of 1945 were of sufficient popular interest that it was found desirable to report them in the form of monographs, such as the series on radar by Division 14 and the monograph on sampling inspection by the Applied Mathematics Panel. Since the material treated in

them is not duplicated in the Summary Technical Report of NDRC, the monographs are an important part of the story of these aspects of NDRC research.

In contrast to the information on radar, which is of widespread interest and much of which is released to the public, the research on subsurface warfare is largely classified and is of general interest to a more restricted group. As a consequence, the report of Division 6 is found almost entirely in its Summary Technical Report, which runs to 24 volumes. The extent of the work of a division cannot therefore be judged solely by the number of volumes devoted to it in the Summary Technical Report of NDRC: account must be taken of the monographs and available reports published elsewhere.

This volume is an index of the technical laboratory and field reports and other reference material which appears in the bibliographies for the Summary Technical Report of NDRC. At the request of the Services, this material has been microfilmed and copies made available to them.

The microfilm index is therefore a record of the numerous research projects conducted by OSRD and its contractors. Progress reports covering the detailed work of these projects were issued from the laboratories, industrial plants, and training grounds, and in some cases from the theaters of war and the actual battlefronts, where scientists and technicians were cooperating with the Army, the Navy, and our allies in the struggle for victory. To the men whose efforts are recorded in these reports we express, on behalf of the Nation, our sincere appreciation.

VANNEVAR BUSH, *Director*
Office of Scientific Research and Development

J. B. CONANT, *Chairman*
National Defense Research Committee

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Abbreviations

The following abbreviations are employed in this volume to refer to the panels and committees of NDRC:

<i>Abbreviation</i>	<i>Panel or Committee</i>
Div. CP	Committee on Wave Propagation
Div. TD	Tropical Deterioration Committee
Div. AMP	Applied Mathematics Panel
Div. APP	Applied Psychology Panel

INTRODUCTION

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THE Microfilm Index volume for the Summary Technical Report of NDRC is divided into three separate sections:

1. A microfilm index and bibliographical listing of reports for each division, panel and committee.
2. A cross reference.
3. A microfilm reel catalogue.

In order that these three sections may be used to best advantage, this Introduction explains the organization and the principles which govern the indexing of the OSRD reports. To locate material readily, it is important to understand that the methods of indexing employed differ from accepted standards because of the type and nature of the material involved.

The reports for microfilming were supplied by the divisions, panels, and committees, and only those reports considered most significant in future research were selected for inclusion in the microfilm. In order that the researchist may be able to locate report material on the microfilm reel, a numerical index was prepared for each division (with the exception of Division 19, which did not submit reports) based on the subject matter of the reports. The total number of reports submitted for a division and the subject matter contained therein largely determined the individual characteristics of an index; in some instances the indices are lengthy and detailed, in others brevity and greater generalization are the keynote. Upon completion of an index, all reports for that division were classified and filed chronologically. Typed listings were then prepared, and the reports were microfilmed in sequence, each being identified on the reel by a card showing both the bibliographical entry and the microfilm index number.

Inasmuch as scientific studies were often conducted in the same field by more than one division, a cross reference was necessary to correlate all allied topics under one main entry. The cross reference entries are based on the subject headings in the indices, as well as items found in report titles in the bibliographical listings.

The microfilm reel catalogue is to be used in conjunction with the reel library; it assists the researchist in locating microfilmed material, as indicated in the bibliographical listings, by means of the index number given beside each report. The catalogue is arranged in two different ways: one is a listing by

NDRC division with identifying reel numbers, and the other a consecutive arrangement by reel numbers giving the index numbers in each reel.

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Microfilm Index

The microfilm indices, as already mentioned, are numerical. They are based on the Dewey Decimal system of classification, being limited to nine main divisions, with subdivisions limited in like manner. Because of the diversified nature of the material it was not possible to formulate a general plan of indexing which could be applicable to all divisions; this was discovered when the looser type of indexing by chapter, as in the case of Division 12, was applied to other divisions. Actually, no two indices are entirely similar in character.

Although a division may be represented by one, two, or more separate Summary Technical Report volumes, the microfilm index prepared for that division disregards these individual unit barriers. The index considers the report material as a single unit, irrespective of its position within the various STR volumes.

As a general rule, each main subject heading is designated by a numeral followed by two zeros, e.g., 100, 200, 300, etc., to 900; major subheadings are shown by two numerals and one zero, e.g., 110, 120 to 190; 210, 220 to 290; etc.; further subheadings are three numerals, e.g., 111, 112 to 119; 211, 212 to 219; etc. This type of subdivision continues for three places past the decimal point, so that a subdivision extended to its limit might be denoted by a possible 214.516.

The reports, once classified, were arranged chronologically within group, and identified by an "M" sequence number. Thus, a hypothetical microfilm number might be given as: Div. 7-214.516-M7, with the Div. 7 representing the division from which the report emanated, the 214.516 the report's actual placement in the Division 7 index, and the M7 indicating that it was the seventh report in that index grouping. The complete microfilm number appears in bulletin type at the bottom of the 3 in. by 5 in. microfilm card which precedes each report on the reel, and corresponds with the bibliographical entry on the Division list. When a microfilmed report is referred to in an STR bibliography, the report can

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be located in the microfilm by means of this index number.

A few special statements should be made regarding the index for Division 6. The bibliographical material consists of 2906 reports, and since it extends through twenty-four STR volumes, it naturally has many characteristics not common to the other divisions. Through the excellent cooperation of the technical consultant for the Division 6 STR, the index was organized with the main emphasis placed upon the numerous underwater devices and instruments. It is mainly because of this emphasis that classification is sometimes likely to appear artificial, and unrelated subject headings may seem to be unexpectedly introduced.

The Division 6 index follows the sequence of the STR volumes in order, and an attempt was made to indicate, wherever possible, a new classification number for each volume or important general topic. For example, Volume 1 has index number 100, and Volume 2b is numbered 200. The absence of any microfilmed reports for Volume 3 results in 300 as the index number for Volume 4, and 400 for Volume 5. Volume 20 is indexed in 700, Volume 21 in 800, and Volume 22 in 900. However, the middle portion of the index (500–653) covers all microfilmed material from Volume 6 through Volume 19. Reports from Volume 6 through Volume 9 are merged on the basis of related subject matter and are indexed from 500 through 540, and 560 through 580. Reports for Volumes 10 and 11 are also merged and are indexed in 550 alone.

Bibliographical Lists of Microfilmed Reports

When the reports were classified and filed chronologically for microfilming, bibliographical listings were prepared. It was decided that the usual running form of entry, with commas separating each item, would be abandoned in favor of entries with prescribed spacing, thereby visually separating each item. As an example, where the research is mainly concerned with authors, the eye is able to concentrate quickly upon that portion of the entry and disregard the rest; where laboratory or institutional information is required, these items can be clearly scanned from the remainder of the entry.

When differences existed between cover and title page, the most informative title was selected. In some instances, parts of titles were combined for completeness. If the title of a report was lacking, one was sup-

plied by borrowing a phrase from the contents of the report. This added title was enclosed in brackets as notification to the reader that the title did not actually appear on the report itself.

Whenever possible, the author's full name was entered, thereby replacing abbreviated names and initials. When it was not possible to ascertain the author's name, "(n.a.)," or "no author" was inserted.

Where there was no information relative to the exact date of a report, "(n.d.);" was inserted. When a date was questionable, a (?) was placed next to that portion of the date which was in doubt. Dates which were supplied from outside sources, other than the report itself, were enclosed in brackets.

Cross Reference

This list is composed of microfilm index headings and items culled from information contained in the report titles—subordinate items which often are obscured in the process of indexing. No cross reference entries were made from material abstracted from the contents of the reports; the Master Index volume is source material for that type of reference.

Entries are as succinct as possible without being cryptic; explanatory or qualifying phrases are introduced in parentheses to avoid ambiguity. Main entries (first letter in upper case) are printed flush with the left-hand border; first indentions qualify the main entry; second indentions qualify the first indentions. There are never more than two indentions; when it is necessary to avoid a third, the second indention is repeated as many times as required, and further qualifying information is enclosed in parentheses to distinguish between them. For example:

Detection

magnetic airborne
systems (Airborne Instruments Laboratory)
systems (AN/ASQ-1)
systems (AN/ASQ-2)

In some few instances, a main entry will lack microfilm index numbers; infrequently, a first indention will also show no index references. These are not to be construed as omissions; in such instances the skeleton form of the cross reference is being maintained, in spite of the fact that there are no corresponding references to be listed for these entries.

See and *See also* italicized entries, which are interspersed throughout, refer the reader to the standard

main entries, where index numbers are actually listed. The following rules apply to the function of *See* and *See also* entries:

1. They refer to the main entry when they appear in the first indentation position [see 2(a) below]; and they refer directly to the first indentation when they appear in the second indentation position [see 2(b) below].

2. Since there is never a third indentation, *See* and *See also* entries perform either one of two functions—they may refer to the first indentation according to rule 1, or they may, perforce, modify the second indentation itself [see 2(c) below]. The reader must decide for himself the entry's role by its applicability. Examples of these entries are listed here:

- (a) Decoys
 See: Noisemakers
- (b) Deformation
 plastic
 See: Cylinders
- (c) Detection
 submarines
 from aircraft
 See also: Search, antiaircraft, and submarine

3. When more than two main entries are referred to in a *See* or *See also* entry, they are separated by a semicolon.

4. When direct reference is made to a first or second indentation of a main entry, the first letter of the main entry is in upper case, the first indentation is separated from it by a comma, and the second indentation is separated from the first by a comma, *e.g.*, *See also: Aircraft, defense, and attack problems, vulnerability; Search, antiaircraft and submarine.*

It will be noted that occasional compound entries in boldface, *e.g.*, **Bombs and Bombing**, occur in the list. This type of entry groups together those main entries which are closely related, although their placement may appear to be disarranged because of the strict alphabetical order. The entry "Bombing" would naturally precede "Bombs" in sequence, and without the aid of a boldface compound entry, the researchist concentrating on Bombing might not realize that other related material follows.

Microfilm Reel Catalogue

As already explained, this catalogue is arranged in two ways. The listing by NDRC division enables the librarian to locate for the researchist specific microfilm reports, as listed in the STR volumes or the bibliographical listings in the Microfilm Index volume. The listing by reel numbers enables the librarian to maintain control of the film library in charging and discharging.

In conclusion, regret should be expressed that because of the rapid disbanding of NDRC after the war and the consequent scattering of personnel, not many division editors were available for consultation during the preparation of the various microfilm indices. In the few cases where such technical advice was available, it was of considerable value in the preparation of the index and in the placement of actual reports within categories. It is hoped that this segregation and classification of the vast amount of scientific material resulting from World War II will be of assistance to the researchist in the future, in spite of its modest pretensions.

J. PARKER SONDHEIMER
Chief Librarian

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Catalogue According to Division 751

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DIVISION 1 · HYPERVELOCITY GUNS AND GUN EROSION

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420.4 Chromium and Other Electroplates

420.5 Fisa Protector

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510.1 Sabot Projectiles

520 Pre-Engraved Projectiles

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530 Band Pressure and Heating

540 Shell Defects

600 MISCELLANEOUS RESEARCH

610 Automatic Gun Mechanism

(See also: 520)

620 Instruments

630 Pyrolytic Plating of Metals

640 Centrifugal Inmelting of Alloy Tubes

650 Chemical Techniques

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Armi, J. L. Johnson and others. OEMsr-536; Service Project Nos. OD-52 and NO-23; OSRD No. 6471. Leeds and Northrup Company. September 27, 1945.

- M6** Temperature distribution in gun barrels. (Report No. A-434.) G. Comenetz and V. Schwab. OEMsr-51; Service Project Nos. OD-52 and NO-23; OSRD No. 6505. Carnegie Institution of Washington. March, 1946.

320 Stresses

(See also: 410.3)

- M1** A theorem on radial deformation in thick tubes. (Memorandum No. A-83M.) Karl F. Herzfeld. OEMsr-516; Service Project Nos. OD-42 and NO-21; OSRD No. 3209. Catholic University of America. January, 1944.
- M2** On longitudinal stresses in guns. (Memorandum No. A-87M.) Karl F. Herzfeld. OEMsr-516; Service Project Nos. OD-42 and NO-21; OSRD No. 3421. Catholic University of America. March, 1944.
- M3** An improved approximation formula for stresses in cylinders. (Memorandum No. A-90M.) Karl F. Herzfeld. OEMsr-516; Service Project Nos. OD-42 and NO-21; OSRD No. 3465. Catholic University of America. April, 1944.
- M4** Formulae for strains in a thick-walled tube near the projectile. (Report No. A-298.) Chester Snow. Service Project Nos. OD-52, OD-42 and NO-23; OSRD No. 4320. National Bureau of Standards. November, 1944.

330 Tapered-Bore

- M1** A brief history of tapered-bore guns. (Preliminary Report No. A-43.) John S. Burlew. OEMsr-51; Service Project No. OD-52. Carnegie Institution of Washington. April 17, 1942.
- M2** 57/40-mm tapered-bore gun tubes and deformable projectiles, including text, figures and diagrams. (Report No. A-456.) (n.a.) OEMsr-534 and OEMsr-467; Service Project Nos. OD-52 and NO-26; OSRD No. 6527. Bryant Chucking Grinder Company and Jones and Lamson Machine Company. October 24, 1945.

340 Hypervelocity Gun

- M1** The behavior of gun liners and coatings tested under conditions of hypervelocity. (Report No. A-404.) Nicol H. Smith. OEMsr-533; Service Project Nos. OD-52 and NO-23; OSRD No. 6475. Franklin Institute. October 2, 1945.
- M2** Metallographic examination of gun liners and coatings tested under conditions of hypervelocity. (Report No. A-405.) J. N. Hobstetter. OEMsr-537; Service Project Nos. OD-52 and NO-23; OSRD No. 6476. Harvard University. October 30, 1945.
- M3** Design and construction of tubes for a hypervelocity 90-mm gun. (Report No. A-446.) J. H. Billings. OEMsr-1499; Service Project Nos. OD-52 and NO-

26; OSRD No. 6539. Drexel Institute of Technology. February, 1946.

400

GUN EROSION

- M1** Investigation of gun erosion at the Geophysical Laboratory. (Volumes I to V. Report Nos. A-263, A-264, A-300, A-437 and A-438 [covering the period from July, 1941 to September, 1945.] Paul R. Heyl. OEMsr-51; Service Project Nos. OD-52 and NO-202; OSRD Nos. 3448, 3449, 4345, 6508 and 6509. Carnegie Institution of Washington.
- M2** The erosion of guns. Part I, Fundamentals of ordnance relating to gun erosion. (Progress Report No. A-90.) John S. Burlew. OEMsr-51; Project Nos. PA-230, OD-52 and others; OSRD No. 882. Carnegie Institution of Washington. September 15, 1942.
- M3** The erosion of guns. Part II, The characteristics of gun erosion. (Progress Report No. A-91.) John S. Burlew. OEMsr-51; Project Nos. PA-230, NO-23 and others. Carnegie Institution of Washington. November 4, 1942.
- M4** Illustrations and descriptions of surface features of eroded gun bores. (Report No. A-440.) H. E. Merwin and M. Sullivan. OEMsr-51; Service Project Nos. OD-52 and NO-23; OSRD No. 6511. Carnegie Institution of Washington. January, 1946.
- M5** Investigation of the control of erosion in guns and the improvement of gun performance. (Final Report No. A-467.) Paul R. Heyl. OEMsr-51; Service Project Nos. OD-32, NO-23 and others; OSRD No. 6538. Carnegie Institution of Washington. Revised: July 31, 1946.

410

Causes of Gun Erosion

410.1

Chemical Factors

- M1** Interaction of carbon monoxide and iron. (Progress Report No. A-92.) J. C. W. Frazer and F. Hubbard Horn. OEMsr-463; Project Nos. PA-230, OD-52 and NO-23. Johns Hopkins University. September 12, 1942.
- M2** A physico-chemical study of gun erosion. (Report No. A-161.) E. Posnjak. OEMsr-51; Service Project Nos. OD-52, NO-23 and NO-26. Carnegie Institution of Washington. March, 1943.
- M3** Chemical thermodynamics of gun erosion. (Report No. A-466.) J. J. Lander. OEMsr-430; Service Project Nos. OD-52 and NO-23; OSRD No. 6537. Bell Telephone Laboratories, Inc. April 14, 1943.
- M4** A study by means of electron and X-ray diffraction of the alteration of steel by hot powder gases. (Report No. A-199.) L. H. Germer, J. J. Lander and others. OEMsr-51 and OEMsr-430; Service Project Nos. OD-52, NO-23 and NO-26; OSRD No. 1659. Carnegie Institution of Washington and Bell Telephone Laboratories, Inc. July, 1943.
- M5** Carbon and nitrogen in gun erosion. (Report No. A-230.) J. F. Schairer and E. G. Zies. OEMsr-51; Service Project Nos. OD-52 and NO-23; OSRD No.

2042. Carnegie Institution of Washington. November, 1943.

- M6** The effect of sulfur and other components of black powder on the erosion of gun steel. Part I, Radio-sulfur study of the reaction of sulfur components of propellant gases with gun steel. Part II, Comparison of erosion of gun steel by smokeless powder with and without black powder or its components. (Report No. A-276.) William D. Urry and Earl Ingerson. OEMsr-51; Service Project Nos. OD-52 and NO-23; OSRD No. 3811. Carnegie Institution of Washington. June, 1944.
- M7** Iron carbonyl formation as a mechanism contributing to gun erosion. (Volume II. Final Report No. A-311.) J. C. W. Frazer, F. Hubbard Horn and R. C. Evans. OEMsr-463; Service Project Nos. OD-52 and NO-23; OSRD No. 6328. Johns Hopkins University. October 31, 1944.
- M8** Chemical thermodynamics of gun erosion. (Report No. A-301.) C. F. Curtiss and Nancy L. Johnson. OEMsr-51; Service Project Nos. OD-52, OD-23 and NO-26; OSRD No. 4363. Carnegie Institution of Washington. November, 1944.
- M9** The penetration of carbon into gun-bore surfaces. (Progress Report No. A-427.) William D. Urry, Einar Jensen and P. J. Hannan. OEMsr-51; Service Project Nos. OD-52 and NO-23; OSRD No. 6498. Carnegie Institution of Washington. November 29, 1945.
- M10** The penetration of nitrogen into steel rifle barrels as measured by a tracer method. (Report No. A-398.) Gordon L. Davis. OEMsr-51; Service Project Nos. OD-52 and NO-23; OSRD No. 6469. Carnegie Institution of Washington. November 30, 1945.
- M11** Electron and X-ray diffraction studies of gun erosion products. (Report No. A-465.) F. E. Haworth. OEMsr-430; Service Project Nos. OD-52 and NO-23; OSRD No. 6536. Bell Telephone Laboratories, Inc. December 6, 1945.
- M12** Study of erosion by adiabatically compressed gases. (Report No. A-429.) William Garten, Jr. and Gordon L. Davis. OEMsr-51; Service Project Nos. OD-52 and NO-23; OSRD No. 6500. Carnegie Institution of Washington. December 21, 1945.
- M13** Studies of erosion products of gun-bore surfaces. (Report No. A-426.) E. G. Zies and C. A. Marsh. OEMsr-51; Service Project Nos. OD-52 and NO-23; OSRD No. 6497. Carnegie Institution of Washington. March 9, 1946.

410.2 Thermal Factors

(See also: 310)

- M1** Application of heat transfer theory to metallographic evidences of gun erosion. (Report No. A-452.) J. N. Hobstetter. OEMsr-537; Service Project Nos. OD-52 and NO-23; OSRD No. 6523. Harvard University. December 20, 1945.
- M2** A method for the determination of the melting temperatures of gun erosion products. (Report No. A-433.) Einar Jensen. OEMsr-51; Service Project

Nos. OD-52 and NO-23; OSRD No. 6504. Carnegie Institution of Washington. January 11, 1946.

- M3** Transient thermal action on gun steel induced by electron bombardment. (Report No. A-432.) William Garten, Jr. and Gordon L. Davis. OEMsr-51; Service Project Nos. OD-52 and NO-23; OSRD No. 6503. Carnegie Institution of Washington. February 15, 1946.

410.3 Mechanical Factors

(See also: 320)

- M1** A method for testing resistance of metals to surface cracking under conditions similar to those obtaining in guns. (Report No. A-271.) Earl Ingerson. OEMsr-51; Service Project Nos. OD-52 and NO-23; OSRD No. 3628. Carnegie Institution of Washington. May, 1944.
- M2** An experiment to determine the effects of stress on gun erosion. (Report No. A-431.) Roy W. Goranson and William Garten, Jr. OEMsr-51; Service Project Nos. OD-52 and NO-23; OSRD No. 6502. Carnegie Institution of Washington. November 26, 1945.

420 Prevention of Gun Erosion

420.1 Erosiveness of Propellants

- M1** Comparison of the erosiveness of propellant powders. (Report No. A-451.) Nicol H. Smith. OEMsr-533; Service Project Nos. OD-52 and NO-23; OSRD No. 6522. Franklin Institute. October 12, 1945.

420.2 Tests of Erosion Resistance

- M1** The testing of erosion-resistant materials and the development of improved machine gun barrels. (Progress Report No. A-409.) E. F. Osborn. OEMsr-51; Service Project Nos. OD-52 and NO-23; OSRD No. 6480. Carnegie Institution of Washington. November 29, 1945.

420.21 Vent Plugs

- M1** Metals tested as erosion vent plugs. (Report No. A-148.) O. H. Loeffler, G. Phair and H. S. Jerabek. OEMsr-51; Service Project Nos. OD-52 and NO-23. Carnegie Institution of Washington. February 19, 1943.
- M2** Vent-plug erosion by the carbon monoxide-carbon dioxide gas system. (Volume I. Final Report No. A-310.) J. C. W. Frazer, F. Hubbard Horn and others. OEMsr-463; Service Project Nos. OD-52 and NO-23; OSRD No. 6327. Johns Hopkins University. October 31, 1944.
- M3** The results of erosion vent-plug tests, particularly under conditions of decreased severity, and their application to the erosion of guns. (Report No. A-403.) H. S. Jerabek, G. Phair and others. OEMsr-51; Service Project Nos. OD-52 and NO-23; OSRD No. 6474. Carnegie Institution of Washington. December 5, 1945.

420.22 Erosion-Testing Gun

- M1** The caliber .50 erosion-testing gun. (Report No. A-450.) Nicol H. Smith. OEMsr-533; Service Project Nos. OD-52 and NO-23; OSRD No. 6521. Franklin Institute. January 7, 1946.

420.23 Other Methods

- M1** Metals tested for resistance to cavitation erosion. (Report No. A-223.) George E. Ziegler and Lloyd E. Line, Jr. OEMsr-613; Service Project Nos. OD-52 and NO-23; OSRD No. 1917. Armour Research Foundation. October, 1943.
- M2** Apparatus for collecting solid particles discharged from a rifle. A simple optical sighting device. (Memorandum Nos. A-93M and A-94M.) J. L. England. OEMsr-51; Service Project Nos. OD-52 and NO-23; OSRD No. 3753. Carnegie Institution of Washington. May, 1944.
- M3** Search for erosion-resistant materials for guns by firing particles of metal and alloys into vacuum to determine their structural and chemical behavior. (Report No. A-407.) E. Posnjak. OEMsr-51; Service Project Nos. OD-52 and NO-23; OSRD No. 6478. Carnegie Institution of Washington. December 4, 1945.

420.3 Gun Liners

- M1** Erosion tests of materials in the form of short liners in a caliber .30 machine gun barrel. (Report No. A-406.) John Wulff. OEMsr-465; Service Project Nos. OD-52 and NO-23; OSRD No. 6477. Johnson Automatics, Inc. April 12, 1944.
- M2** Gun barrel liners. Materials, insertion and testing. (Report No. A-408.) Frank D. Cotterman, N. A. Ziegler and John P. Magos. OEMsr-629; Service Project Nos. OD-52 and NO-23; OSRD No. 6479. Crane Company. January 16, 1946.
- M3** Contributions to the development of erosion-resistant materials for gun liners and linings. (Final Report No. A-457.) P. H. Brace. OEMsr-915; Service Project Nos. OD-52 and NO-23; OSRD No. 6528. Westinghouse Electric and Manufacturing Company, Inc. June 24, 1946.

420.31 Stellite

- M1** Investigation of certain methods for making gun linings of stellite and other erosion-resistant materials. (Report No. A-418.) John Wulff. OEMsr-608; Service Project Nos. OD-52 and NO-23; OSRD No. 6489. Massachusetts Institute of Technology. September 28, 1945.
- M2** Production of modified caliber .30 machine gun barrels with stellite liners. (Final Report No. A-455.) Melvin M. Johnson, Jr. OEMsr-1433; Service Project Nos. OD-52 and NO-23; OSRD No. 6526. Johnson Automatics, Inc. September 28, 1945.
- M3** Caliber .30 machine gun barrel. Production of modified machine gun barrels with stellite liners, including studies of draw rifling. (Volume I. Report No. A-463.) (n.a.) OEMsr-1438; Service Project

Nos. OD-52 and NO-23; OSRD No. 6534. Remington Arms Company, Inc. October 3, 1945.

- M4** Pilot plant for production of modified caliber .50 machine gun barrels with stellite liners. (Final Report No. A-447.) Ray A. Mueller, Frank D. Cotterman and John P. Magos. OEMsr-1414; Service Project Nos. OD-52 and NO-23; OSRD No. 6518. Crane Company. October 17, 1945.
- M5** Studies of the application of stellite No. 21 to gun bores. (Report No. A-417.) T. H. Gray and Don R. Mosher. OEMsr-915; Service Project Nos. OD-52 and NO-23; OSRD No. 6488. Westinghouse Electric and Manufacturing Company, Inc. November 12, 1945.
- M6** Production of stellite liners by centrifugal casting. (Report No. A-453.) William H. Shallenberger. OEMsr-1424; Service Project Nos. OD-52 and NO-23; OSRD No. 6524. Industrial Research Laboratories, Inc. December, 1945.
- M7** Stellite No. 21 as a material for gun liners. Metallurgy and properties. (Report No. A-416.) W. A. Wissler. OEMsr-1330; Service Project Nos. OD-52 and NO-23; OSRD No. 6487. Union Carbide and Carbon Research Laboratories, Inc. January 17, 1946.
- M8** Preparation and testing of 37-mm stellite liners. (Report No. A-419.) John S. Burlew. Service Project Nos. OD-52 and NO-23; OSRD No. 6490. [Carnegie Institution of Washington(?)] (n.d.)

420.32 Molybdenum

- M1** Molybdenum as a material for an erosion-resistant gun liner. P. H. Brace and J. W. Marden. Appendices: Stresses in built-up cylinder under internal pressure and temperature change. Stresses in split liners for guns. A. M. Wahl. Firing tests on molybdenum liners at the Franklin Institute. (n.a.) (Report No. A-273.) OEMsr-915 and OEMsr-1205; Service Project Nos. OD-52 and NO-23; OSRD No. 3700. Westinghouse Electric and Manufacturing Company, Inc. May, 1944.
- M2** The semi-commercial preparation of molybdenum carbonyl. (Final Report No. A-422.) Asa L. McCoy. OEMsr-1320; Service Project Nos. OD-52 and NO-23; OSRD No. 6493. Climax Molybdenum Company. July 20, 1945.
- M3** Fabrication of molybdenum for use as a gun liner material. (Final Report No. A-423.) J. W. Marden. OEMsr-1205; Service Project Nos. OD-52 and NO-23; OSRD No. 6494. Westinghouse Electric and Manufacturing Company, Inc. October 31, 1945.
- M4** Development of molybdenum for gun liners. (Report No. A-424.) P. H. Brace. OEMsr-915; Service Project Nos. OD-52 and NO-23; OSRD No. 6495. Westinghouse Electric and Manufacturing Company, Inc. February 1, 1946.
- M5** Experiments on the melting of molybdenum. (Report No. A-425.) F. Palmer. OEMsr-1273 and OEMsr-915; Service Project Nos. OD-52 and NO-23; OSRD No. 6496. Climax Molybdenum Company

and Westinghouse Electric and Manufacturing Company, Inc. (n.d.)

420.33 Chromium-Base Alloys

- M1** The preparation of chromium by the thermal decomposition of chromium iodide. (Memorandum No. A-78M.) Don R. Mosher. OEMsr-915; Service Project Nos. OD-52 and NO-23; OSRD No. 2082. Westinghouse Electric and Manufacturing Company, Inc. November, 1943.
- M2** Chromium and chromium-base alloys as materials for gun liners. (Report No. A-411.) P. H. Brace, J. F. Schairer and N. A. Ziegler. OEMsr-915; Service Project Nos. OD-52 and NO-23; OSRD No. 6482. January 5, 1946.
- M3** Development of chromium-base hot-hard alloys as gun liner materials. (Final Report No. A-415.) Robert M. Parke and F. P. Bens. OEMsr-1273; Service Project Nos. OD-52 and NO-23; OSRD No. 6486. Climax Molybdenum Company. January 21, 1946.

420.34 Hastelloy

- M1** Hastelloy C as a liner material for machine gun barrels. (Final Report No. A-464.) W. A. Wissler and F. S. Badger. OEMsr-1330; Service Project Nos. OD-52 and NO-23; OSRD No. 6535. Union Carbide and Carbon Research Laboratories, Inc. May 16, 1946.

420.35 Refractaloy

- M1** Refractaloy 70 as a liner material for caliber .50 barrels. (Report No. A-420.) T. H. Gray. OEMsr-915; Service Project Nos. OD-52 and NO-23; OSRD No. 6491. Westinghouse Electric and Manufacturing Company, Inc. January 10, 1946.

420.4 Chromium and Other Electroplates

- M1** Symposium on chromium plating [held at] Washington, D. C., May 14, 1943. (Report No. A-414.) (n.a.) Service Project Nos. OD-52 and NO-23; OSRD No. 6485. [May, 1943(?)]
- M2** An illustrated study of the effects of firing on chromium-plated bores of caliber .50 machine guns. (Report No. A-413.) H. E. Merwin and M. Sullivan. OEMsr-51; Service Project Nos. OD-52 and NO-23; OSRD No. 6484. Carnegie Institution of Washington. December, 1945.
- M3** Experimental electroplating of gun barrels. (Report No. A-412.) W. Blum, A. Brenner and V. A. Lamb. Service Project Nos. OD-52 and NO-23; OSRD No. 6483. National Bureau of Standards. December 21, 1945.

420.5 Fisa Protector

- M1** Fisa protectors. Design, production and tests. (Final Report No. A-449.) Nicol H. Smith. OEMsr-533; Service Project Nos. OD-52 and NO-23; OSRD No. 6520. Franklin Institute. November 20, 1945.

430 Muzzle Erosion

- M1** Studies of muzzle erosion data at the Naval Proving Ground. Part I, Muzzle erosion and range dispersion. George V. Cresson. Part II, A Compendium of muzzle erosion data. Elaine M. Frankel and Gerry Kovsky. (Report No. A-430.) OEMsr-51 and OEMsr-533; Service Project Nos. OD-52 and NO-23; OSRD No. 6501. Carnegie Institution of Washington and Franklin Institute. June 21, 1945.
- M2** The erosion of guns at the muzzle. (Report No. A-357.) Lloyd E. Line, Jr. OEMsr-51, OEMsr-533 and others; Service Project Nos. OD-52, NO-23 and NO-26; OSRD No. 6322. Carnegie Institution of Washington, Franklin Institute and others. August 23, 1945.
- M3** Studies of worn muzzle sections of guns by laboratory techniques. (Report No. A-458.) Lloyd E. Line, Jr. and J. N. Hobstetter. OEMsr-537 and OEMsr-51; Service Project Nos. OD-52 and NO-23; OSRD No. 6529. Carnegie Institution of Washington. January 28, 1946.

500 PROJECTILES

510 Subcaliber Projectiles

- M1** Stability of subcaliber projectiles. (Progress Report No. A-88.) Charles L. Critchfield. OEMsr-51; Project Nos. PA-260, OD-52 and NO-26. Carnegie Institution of Washington. September 8, 1942.
- M2** Development of subcaliber projectiles for the Hispano-Suiza gun. (Report No. A-233.) Charles L. Critchfield and John McG. Millar. OEMsr-51; Service Project Nos. OD-52 and NO-26; OSRD No. 2067. Carnegie Institution of Washington. November, 1943.

510.1 Sabot Projectiles

- M1** Sabot projectiles for cannon. (Report No. A-234.) W. D. Crozier, H. F. Dunlap and others. OEMsr-668; Service Project Nos. OD-52 and NO-26; OSRD No. 3010. University of New Mexico. December, 1943.
- M2** Molding sabots for projectiles. (Report No. A-278.) (n.a.) OEMsr-886; Service Project Nos. OD-52 and NO-26; OSRD No. 3832. Arthur D. Little, Inc. June, 1944.
- M3** Development of an all-metal type of sabot projectile. (Report No. A-461.) (n.a.) OEMsr-1368; Service Project Nos. OD-52 and NO-26; OSRD No. 6532. Remington Arms Company, Inc. October 12, 1945.
- M4** A production process for the manufacture of an all-metal type of sabot projectile. (Report No. A-462.) (n.a.) OEMsr-1368; Service Project Nos. OD-52 and NO-26; OSRD No. 6533. Remington Arms Company, Inc. October 12, 1945.
- M5** Work on sabot projectiles by the University of New Mexico under Contract OEMsr-668 and supplements, 1942 to 1944. (Report No. A-428.) Compiled by: J. W. Greig. OEMsr-668; Service Project

Nos. OD-52 and NO-26; OSRD No. 6499. University of New Mexico. October, 1946.

520 Pre-Engraved Projectiles

(See also: 610)

M1 Exact theory of the stress distribution in a shell due to engraving. (Report No. A-207.) Henri A. Jordan, Karl F. Herzfeld and Vincent O. McBrien. OEMsr-516; Service Project Nos. OD-42 and NO-21; OSRD No. 1714. Catholic University of America. July, 1943.

M2 Pre-engraved projectiles. (Report No. A-448.) Nicol H. Smith. OEMsr-533; Service Project Nos. OD-52 and NO-23; OSRD No. 6519. Franklin Institute. December 6, 1945.

530 Band Pressure and Heating

M1 On the heating of rotating bands. (Report No. A-256.) Charles L. Critchfield. OEMsr-51; Service Project Nos. OD-52, NO-23 and NO-26; OSRD No. 3329. Carnegie Institution of Washington. February, 1944.

M2 Deduction of practical formulas for the stress in the mantle of a shell due to band pressure and powder gas pressure. (Report No. A-281.) Karl F. Herzfeld and Virginia Griffing. OEMsr-516; Service Project No. OD-42; OSRD No. 3868. Catholic University of America. June, 1944.

M3 Static band pressures in 37-mm projectiles. (Parts I to III. Report Nos. A-312, A-442 and A-443.) Frank A. Biberstein, Jr., Ralph Brown and others. OEMsr-516; Service Project No. OD-42; OSRD Nos. 4550, 6513 and 6514. Catholic University of America. December, 1944 and August 28, 1945.

M4 Stresses in shells due to band pressure. (Final Report No. A-445.) Karl F. Herzfeld. OEMsr-516; Service Project No. OD-42; OSRD No. 6516. Catholic University of America. December 28, 1945.

540 Shell Defects

M1 Methods for detecting defects in the base of a shell forging. (Progress Report No. A-31.) Roy W. Goranson. Service Project No. OD-32. Carnegie Institution of Washington. February 6, 1942.

M2 A method of investigating the deformation of deformable projectiles. (Memorandum No. A-36M.) H. L. Whittemore and Leroy R. Sweetman. Project Nos. OD-52, NO-26 and PA-260; OSRD No. 631. National Bureau of Standards. July 16, 1942.

600 MISCELLANEOUS RESEARCH

610 Automatic Gun Mechanism

(See also: 520)

M1 The Johnson 20-mm automatic aircraft cannon. (Report No. A-454.) William H. Shallenberger. OEMsr-746 and OEMsr-1375; Service Project No. NO-124; OSRD No. 6525. Johnson Automatics, Inc. and University of California. December 18, 1945.

620 Instruments

M1 A vertical step-sweep circuit for the cathode-ray oscillograph. (Memorandum No. A-77M.) Nicholas M. Smith, Jr. OEMsr-51; Service Project Nos. OD-52, NO-23 and NO-26; OSRD No. 2081. Carnegie Institution of Washington. November, 1943.

M2 A new thread-collocating gage. (Memorandum No. A-85M.) Francis E. Blake and Donald F. Ringie. OEMsr-467; Service Project Nos. OD-52 and NO-26; OSRD No. 3287. Jones and Lamson Machine Company. February, 1944.

630 Pyrolytic Plating of Metals

M1 The synthesis of chromium hexacarbonyl. (Report No. A-401.) Pyrolytic plating of chromium from the vapor of chromium hexacarbonyl. (Report No. A-402.) Benton B. Owen. OEMsr-1318; Service Project Nos. OD-42 and NO-23; OSRD Nos. 6472 and 6473. Yale University. September 17 and October 8, 1945.

M2 Pyrolytic plating from the carbonyls of molybdenum, tungsten and chromium. (Report No. A-421.) L. H. Germer and J. J. Lander. OEMsr-1184; Service Project Nos. NO-23 and OD-52; OSRD No. 6492. Bell Telephone Laboratories, Inc. November 30, 1945.

640 Centrifugal Inmelting of Alloy Tubes

M1 Progressive centrifugal inmelting for the preparation of alloy tubes. (Report No. A-410.) P. H. Brace. OEMsr-915; Service Project Nos. OD-52 and NO-23; OSRD No. 6481. Westinghouse Electric and Manufacturing Company, Inc. April 8, 1946.

650 Chemical Techniques

M1 Notes on the potentiometric titration of iron. (Memorandum No. A-95M.) Einar Jensen. OEMsr-51; Service Project Nos. OD-52 and NO-23; OSRD No. 3869. Carnegie Institution of Washington. July, 1944.

M2 Anodic polishing for the removal of very thin layers from steel surfaces. (Memorandum No. A-96M.) William D. Urry and Einar Jensen. OEMsr-51; Service Project Nos. OD-52 and NO-23; OSRD No. 3968. Carnegie Institution of Washington. July, 1944.

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100 EXPLOSION

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110 Air Blast

- M1** Small-charge air blast experiments. (Report No. A-191.) George T. Reynolds. OEMsr-260; Service Project Nos. OD-79, NO-11 and others; OSRD No. 1518. Princeton University. June, 1943.
- M2** Small-charge air blast measurements. Order of effectiveness of explosives. (Division 8.) Paul C. Cross, W. D. Kennedy and D. F. Hornig. OEMsr-569; Service Project Nos. OD-03 and NO-144; OSRD No. 3479. Woods Hole Oceanographic Institution. April 1, 1944.
- M3** The effect of air burst on the blast from bombs and small charges. Part I, Experimental results. (Division 8.) (n.a.) OEMsr-569 and OEMsr-596; Service Project No. OD-03; OSRD No. 4246. Woods Hole Oceanographic Institution and Stanolind Oil and Gas Company. October 16, 1944.
- M4** The blast wave in air produced by line charges. (Report No. A-343.) Stuart R. Brinkley, Jr. and John G. Kirkwood. OEMsr-121; Service Project Nos. OD-03 and NO-224; OSRD No. 5659. Cornell University. October, 1945.
- M5** Air burst for blast bombs. (Report No. A-322.) (n.a.) OEMsr-260; OEMsr-569 and others; Service Project Nos. OD-03, NO-224 and others; OSRD No. 4943. Princeton University, Woods Hole Oceanographic Institution and others. April, 1945.
- M6** The effect of air burst on the blast from bombs and small charges. Part II, Analysis of experimental results. (Report No. A-320.) R. R. Halverson. OEMsr-569; Service Project No. OD-03; OSRD No. 4899. Woods Hole Oceanographic Institution. April, 1945.

111 Blast Pressures

- M1** Measurement of blast pressures from 4000-lb bombs. (Division 8.) E. Bright Wilson, Jr. OEMsr-334; Service Project Nos. OD-02 and OD-03; OSRD No. 1153. Harvard University. January 23, 1943.
- M2** The measurement of blast pressures in Aberdeen tests. (Report No. A-186.) Curtis W. Lampson. OEMsr-260; Service Project Nos. OD-79, NO-11 and others; OSRD No. 1465. Princeton University. May, 1943.
- M3** Charge orientation tests. (Report No. A-193.) George T. Reynolds. OEMsr-260; Service Project

Nos. OD-79, NO-11 and others; OSRD No. 1532. Princeton University. June, 1943.

- M4** Blast pressures and momenta from some large bombs. (Division 8.) E. Bright Wilson, Jr. and W. D. Kennedy. OEMsr-334; Service Project Nos. OD-02 and OD-03; OSRD No. 3046. Harvard University. November 17, 1943.

111.1 Measuring Instruments

111.11 Gauges

- M1** Construction of resistance strain gauges. (Memorandum No. A-59M.) Robert J. Hansen. OEMsr-260; Service Project Nos. CE-5, NO-11 and others; OSRD No. 1003. Princeton University. November, 1942.
- M2** Cable compensation for piezoelectric gauges. (Memorandum No. A-63M.) Curtis W. Lampson. OEMsr-260; Service Project Nos. CE-2, NO-11 and others; OSRD No. 1179. Princeton University. January, 1943.
- M3** Development of explosion pressure gauges and recording equipment. (Division 8. Progress Report to July 23, 1943.) (n.a.) OEMsr-596; Service Project Nos. OD-03 and NO-144; OSRD No. 1739. Stanolind Oil and Gas Company. August 24, 1943.
- M4** The use of electrical cables with piezoelectric gauges. (Report No. A-306.) R. H. Cole. OEMsr-569; Service Project No. NO-223; OSRD No. 4561. Woods Hole Oceanographic Institution. January, 1944.
- M5** Piezoelectric measurements of blast pressures in M-4 tank from explosive charges detonated outside of vehicle. (Report No. A-297.) Daniel Silverman and H. M. Lang. OEMsr-596; Service Project No. OD-03; OSRD No. 4307. Stanolind Oil and Gas Company. November, 1944.
- M6** Development of blast pressure gauges and recording equipment. (Report No. A-313, to October 1, 1944.) Daniel Silverman and H. M. Lang. OEMsr-596; Service Project No. OD-03; OSRD No. 4619. Stanolind Oil and Gas Company. January, 1945.
- M7** Development of blast pressure gauges and recording equipment. (Part II. Final Report No. A-352 [for the period] October 1, 1944 to October 1, 1945.) H. M. Lang and Daniel Silverman. OEMsr-596; Service Project Nos. OD-03, NO-283 and others; OSRD No. 6317. Stanolind Oil and Gas Company. November, 1945.
- M8** Construction of tourmaline gauges for piezoelectric measurement of explosion pressure waves. (Progress Report No. A-378 [for the period] February, 1945 through September, 1945.) Clifford Frondel. OEMsr-569; Service Project Nos. OD-03 and NO-223; OSRD No. 6256. Woods Hole Oceanographic Institution. January, 1946.
- M9** A condenser-type frequency-modulating gauge for

blast pressure measurements. (Report No. A-355.) Lincoln G. Smith. OEMsr-260; Service Project Nos. OD-03 and NO-283; OSRD No. 6320. Princeton University. January, 1946.

- M10** Shock tube, piezoelectric gauges and recording apparatus. (Final Report No. A-356.) J. C. Fletcher, W. T. Read and others. OEMsr-260; Service Project Nos. OD-03 and NO-283; OSRD No. 6321. Princeton University. February, 1946.

111.12 Other Instruments

- M1** The measurement of transient stress, displacement and pressure. (Progress Report No. A-73.) Curtis W. Lampson. OEMsr-260; Service Project Nos. CE-5, NO-11 and others; OSRD No. 756. Princeton University. July, 1942.
- M2** A method of low-frequency compensation of amplifiers to reproduce transients of long duration. (Report No. A-255.) Curtis W. Lampson. OEMsr-260; Service Project Nos. CE-5, NO-12 and others; OSRD No. 3293. Princeton University. March, 1944.
- M3** Mobile oscillographic laboratory. (Final Report No. A-307.) Curtis W. Lampson and Walker Bleakney. OEMsr-675; Service Project No. OD-79; OSRD No. 4570. Princeton University. January, 1945.
- M4** The detonation of TMI-43 indicator by blast. (Report No. A-331.) J. L. Brenner. OEMsr-260; Service Project No. OD-03; OSRD No. 5179. Princeton University. June, 1945.
- M5** Theory, calibration and use of diaphragm blast meters. (Report No. A-392 [for the period] February, 1945 to December, 1945.) W. T. Read. OEMsr-260; Service Project No. OD-03; OSRD No. 6463. Princeton University. March, 1946.

112 Blast Waves

- M1** Tables and graphs of the theoretical peak pressures, energies and positive impulses of blast waves in air. (Report No. A-327.) Stuart R. Brinkley, Jr. and John G. Kirkwood. OEMsr-121; Service Project Nos. OD-03 and NO-224; OSRD No. 5137. Cornell University. May, 1945.
- M2** Theoretical blast wave curves for cast TNT. (Report No. A-341.) John G. Kirkwood and Stuart R. Brinkley, Jr. OEMsr-121; Service Project Nos. OD-03 and NO-224; OSRD No. 5481. Cornell University. August, 1945.

113 Miscellaneous Air Explosion Problems

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- M2** Armor-piercing bomb test. Comment. (CPPAB Interim Report No. 9 [for the period] 1941 [to] 1942.) Richard A. Beth. National Research Council. April, 1942.
- M3** A brief summary of recent data on penetration in concrete at various scales. (CPPAB Interim Report No. 18 [for the period] 1941 [to] 1942.) Richard A. Beth. National Research Council. June, 1942.
- M4** Impact tests of reinforced concrete beams. (Part I, Summary Report No. A-125.) Frank E. Richart and Nathan M. Newmark. OEMsr-318; Service Project Nos. CE-5, NO-12 and others; OSRD No. 1105. University of Illinois. December, 1942.
- M5** Penetration and explosion tests on concrete slabs. Report I, Data. (CPPAB Interim Report No. 20.) Richard A. Beth and J. Gordon Stipe, Jr. National Research Council. January, 1943.
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- M14** Ballistic tests on small concrete slabs. (CFD Interim Report No. 28.) J. Gordon Stipe, Jr., Marinus E. DeReus and others. National Research Council. June 30, 1944.
- M15** Ballistic tests of small concrete slabs. Tables of data. (CFD Interim Report No. 28, Appendix A.) J. Gordon Stipe, Jr., Marinus E. DeReus and others. National Research Council. June 30, 1944.
- M16** Contact explosions on concrete. (CFD Interim Report No. 29.) Donald G. Kretsinger. National Research Council. June 30, 1944.
- M17** Composite slabs. (CFD Interim Memorandum No. M-13.) J. Gordon Stipe, Jr. National Research Council. June 30, 1944.
- M18** Repeated-fire and edge-fire effects on small concrete slabs. (CFD Interim Memorandum No. M-12.) J. Gordon Stipe, Jr. National Research Council. July, 1944.
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- M22** Contact explosions against concrete. (Report No. A-354.) I. M. Freeman, Donald G. Kretsinger and A. H. Taub. OEMsr-260; Service Project No. AN-29; OSRD No. 6319. Princeton University. December, 1945.

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320 Projectiles

321 Frangible

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- M3** Terminal ballistics of tungsten-carbide projectiles. Effect of carrier. (Part II. Report No. A-396, covering period from June to August, 1945.) Richard J. Emrich. OEMsr-260; Service Project Nos. OD-75 and NO-11; OSRD No. 6467. Princeton University. March, 1946.

330 Muzzle Blast

- M1** Muzzle blast. Deflector. (Report No. PMR-20.) George T. Reynolds. [OEMsr-260;] Service Project No. OD-154. Princeton University. April 15, 1944.
- M2** Muzzle blast pressure measurements. (Report No. PMR-21.) George T. Reynolds. [OEMsr-260;] Service Project No. OD-154. Princeton University. April 15, 1944.
- M3** A study of blast deflectors. (Final Report No. A-351.) Clark B. Millikan, E. E. Sechler and R. D. Buhler. OEMsr-1351; Service Project Nos. OD-154 and OD-160; OSRD No. 6316. California Institute of Technology. October, 1945.
- M4** Muzzle blast. Its characteristics, effects and control. (Final Report No. A-391 [for the period] November, 1944 to November, 1945.) J. J. Slade, Jr. OEMsr-260; Service Project Nos. OD-154 and OD-160; OSRD No. 6462. Princeton University. March, 1946.

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- M1** The study of the effect of muzzle brake design on the recoil of guns. ([Part] I. Progress Report No. A-320.) Frank R. Simpson and Nicol H. Smith. OEMsr-1398; Service Project No. OD-160; OSRD No. 4389. Franklin Institute. November, 1944.
- M2** On the emptying of a gun. ([Part] I. Report No. A-336.) J. J. Slade, Jr. and C. H. Fletcher. OEMsr-260; Service Project Nos. OD-154 and OD-160; OSRD No. 5399. Princeton University. August, 1945.
- M3** The effect of muzzle brake design on the recoil of guns. (Final Report No. A-387.) (n.a.) OEMsr-1398; Service Project Nos. OD-160 and OD-154; OSRD No. 6458. Franklin Institute. February, 1946.

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410 Superspeed Wind Tunnel

- M1** Proposal and tentative plans for a superspeed wind tunnel. (Preliminary Report No. A-9.) Theodor von Kármán. OSRD No. 13. [California Institute of Technology.] July, 1941.
- M2** The superspeed wind tunnel. (Progress Report No. A-10, as of September 22, 1941.) Theodor von Kármán. Service Project No. OD-24; OSRD No. 14. California Institute of Technology. September, 1941.
- M3** The model supersonic wind tunnel. (Progress Report No. A-38, as of March 20, 1942.) Theodor von Kármán. NDCrc-36; Service Project No. OD-24;

OSRD No. 519. California Institute of Technology. April, 1942.

- M4** The model supersonic wind tunnel project. (Final Report No. A-269.) Allen E. Puckett. NDCrc-36; Project Nos. OD-24, NO-3 and P2-401; OSRD No. 3569. California Institute of Technology. April, 1944.

420 Impact Loads

- M1** The reactions of thin beams and slabs to impact loads. Part I, General theory. (CPPAB Interim Report No. 13 [for the period] 1941 to 1942.) H. P. Robertson and Ralph J. Slutz. National Research Council. June, 1942.
- M2** The reactions of thin beams and slabs to impact loads. Part II, Beams. (CPPAB Interim Report No. 14 [for the period] 1941 to 1942.) H. P. Robertson and Ralph J. Slutz. National Research Council. June, 1942.
- M3** The behavior of long beams under impact loading. (Report No. A-216.) Pol E. Duwez, Donald S. Clark and others. OEMsr-348; Project Nos. NO-11, NS-109 and P2-303; OSRD No. 1828. California Institute of Technology. September, 1943.
- M4** The analysis of elastic structures acted upon by impulsive loadings. (Report No. A-219.) John B. Wilbur. OEMsr-468; Service Project Nos. CE-5, NO-12 and others; OSRD No. 1915. Massachusetts Institute of Technology. September, 1943.
- M5** The behavior of large plates under impact loading. (Report No. A-254.) Pol E. Duwez, Donald S. Clark and others. OEMsr-348; Project Nos. NO-11, NS-109 and P2-303; OSRD No. 3292. California Institute of Technology. February, 1944.
- M6** The limit design of structures subjected to impulsive loads, with application to military structures. (Report No. A-293.) Merit P. White. Service Project Nos. CE-36, NO-11 and NO-12; OSRD No. 4192. September, 1944.

430 Deformation of Materials Under Pressure

- M1** On the propagation of plastic deformation in solids. (Progress Report No. A-29.) Theodor von Kármán. Service Project Nos. CE-5 and CE-6; OSRD No. 365. January, 1942.
- M2** Preliminary experiments on the propagation of plastic deformation. (Progress Report No. A-33, supplementary to Report No. A-29.) Pol E. Duwez. Service Project Nos. CE-5 and CE-6; OSRD No. 380. February, 1942.
- M3** Addendum to von Kármán's theory of the propagation of plastic deformation in solids. (Memorandum No. A-37M.) C. Zener and J. H. Hollomon. Service Project Nos. CE-5 and CE-6; OSRD No. 659. June, 1942.
- M4** A note on von Kármán's theory of the propagation of plastic deformation in solids. (Memorandum No. A-41M.) H. F. Bohnenblust. OEMsr-260; Service Project Nos. CE-5, NO-11 and others; OSRD No. 664. Princeton University. June, 1942.

431 Types and Forms of Materials

- M1** The plastic properties of metals at high rates of strain. (Progress Report No. A-41.) Frederick Seitz, Jr., Andrew W. Lawson and Park H. Miller, Jr. OEMsr-132; Service Project Nos. OD-34, CE-5 and CE-6; OSRD No. 495. University of Pennsylvania. April, 1942.

431.1 Plates

- M1** On the static and dynamic plastic bending of plates. (Report No. A-228.) D. H. Hyers. OEMsr-348; Project Nos. NO-11, NS-109 and P2-303; OSRD No. 2018. California Institute of Technology. November, 1943.
- M2** Theory of the plastic deformation of thin plates, with applications. (Report No. A-344.) John M. Richardson. OEMsr-121; Service Project Nos. OD-03, NO-223 and others; OSRD No. 5660. Cornell University. October, 1945.

431.11 Steel

- M1** Plastic deformation of steel under high pressure. (Progress Report No. A-95.) Percy W. Bridgman. OEMsr-201; Service Project Nos. CE-5, NO-11 and others; OSRD No. 919. Harvard University. September, 1942.
- M2** Plastic deformation of steel under high pressure. (Second Progress Report, No. A-162.) Percy W. Bridgman. OEMsr-201; Project Nos. NO-11 and P2-302; OSRD No. 1347. Harvard University. March, 1943.
- M3** Deflection and perforation of steel plates at impact velocities up to 150 ft/sec. (Preliminary Report No. A-175.) Pol E. Duwez, D. S. Wood and Donald S. Clark. OEMsr-348; Project Nos. NO-11, NS-109 and P2-303; OSRD No. 1402. California Institute of Technology. April, 1943.
- M4** Plastic deformation of steel under high pressure. (Third Progress Report, No. A-218.) Percy W. Bridgman. OEMsr-201; Project Nos. NO-11 and P2-303; OSRD No. 1868. Harvard University. September, 1943.
- M5** Distortion of an armor plate steel under simple compressive stress to high strains. (Report No. A-235.) Percy W. Bridgman. OEMsr-201; Project Nos. NO-11 and P2-302; OSRD No. 3019. Harvard University. December, 1943.
- M6** The plastic properties of steel under large strains and high stresses. (Final Report No. A-294.) Percy W. Bridgman. OEMsr-201; Service Project No. NO-11; OSRD No. 4256. Harvard University. October, 1944.

431.2 Cylinders**431.21 Copper Crusher Cylinders and Spheres**

- M1** The speed effect in copper crusher cylinders and copper spheres. (Progress Report No. A-63.) Frederick Seitz, Jr., Andrew W. Lawson and Park H. Miller, Jr. OEMsr-132; Service Project Nos. OD-34,

CE-5 and others; OSRD No. 619. University of Pennsylvania. June, 1942.

- M2** High-speed compression testing of copper crusher cylinders and spheres. (Report No. A-257.) O. C. Simpson, E. L. Fireman and James S. Koehler. OEMsr-825; Project Nos. OD-57, NO-7 and P2-301; OSRD No. 3330. Carnegie Institute of Technology. March, 1944.
- M3** High-speed compression testing of copper crusher cylinders and spheres. (Part I. Final Report No. A-324.) G. H. Winslow and W. H. Bessey. OEMsr-825; Service Project Nos. OD-57, NO-7 and NS-109; OSRD No. 5039. Carnegie Institute of Technology. April, 1945.

431.22 Cylinders and Diaphragms

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- M2** Weekly Progress Report Nos. 18 to 20, for the period February 23 to March 15, 1942. (Report Nos. CIT/PMC-1.18 to -1.20.) (n.a.) OEMsr-250. California Institute of Technology.
- M3** Summaries of projects of Division A, Armor and Ordnance, as of March 1, June 30 and August 31, 1942. (Progress Report Nos. A-40, A-75 and A-100.) (n.a.) OSRD No. 467.
- M4** Summaries of projects of Division A, Section H, as of May 1, 1942. (Progress Report No. A-60.) (n.a.) May, 1942.
- M5** [Weekly progress report of the California Institute of Technology.] (Report Nos. CIT/PMC-1.39, -1.98, -2.4, -2.6 and -2.8 [for the] period ending July 26, 1942, September 19, October 13, November 14 and 28, 1943.) (n.a.) OEMsr-418. California Institute of Technology.
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- M15** Rocket developments. S. R. Avella. OEMsr-256; Service Project Nos. OD-14, CWS-10 and others; OSRD No. 6170. Bell Telephone Laboratories, Inc. February 15, 1946.

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- M2** Filing and indexing system for Kellogg files. (Report No. CIT/OZC-1.2.) (n.a.) [California Institute of Technology.] March 5, 1943.

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- M2** Notes on the external ballistics of rotating rockets. (Report No. CIT/JPC-18.) Leverett Davis, Jr. OEMsr-418; Service Project No. NO-215. California Institute of Technology. April 6, 1944.
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- 241 Radiation**
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- M1** Determination of the geometrical malalignment of rocket projectiles. (Report No. CIT/JGC-5.) Thomas L. Lauritsen, L. A. Richards and others. OEMsr-418. California Institute of Technology. January 28, 1943.
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- M2** Dynamic stability of bombs and projectiles. (Report No. CIT/JPC-10.) M. A. Biot. OEMsr-418. California Institute of Technology. September 6, 1943.
- M3** The influence of the magnus moment on the stability of rotating projectiles. (Report No. CIT/JPC-29.) Leverett Davis, Jr. and James W. Follin, Jr. OEMsr-418; OSRD No. 2529. California Institute of Technology. September 1, 1945.
- 243.1 Deflection by Wind**
- M1** Effect of wind on the mean deflection of rockets. (Report No. CIT/JPC-7.) Leon Blitzer. OEMsr-418. California Institute of Technology. February 1, 1943.
- M2** Effect of wind on the mean deflection of rockets. (Report No. A-169.) Leon Blitzer. OEMsr-418; Service Project Nos. OD-26, CWS-22 and NO-33. California Institute of Technology. April, 1943.
- M3** Qualitative discussion of equilibrium yaw. (Report No. CIT/OPC-15.) Sylvan Rubin. California Institute of Technology. December 22, 1943.
- M4** Effect of wind during burning. (Report No. CIT/OPC-15.1.) James W. Follin, Jr. California Institute of Technology. March 6, 1945.
- M5** The effect of wind on ground-fired spin-stabilized rockets during burning. (Local Intermediate Report No. CIT/IPC-76.) James W. Follin, Jr. California Institute of Technology. April 23, 1945.
- M6** Approximate formulae for calculation of deflection of rockets. (Report No. CIT/IPC-45.) J. G. Waugh. California Institute of Technology. (n.d.)
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- M1** Formulas for the spin produced by inclined jets. (Local Intermediate Report No. CIT/IPC-55.) Leverett Davis, Jr. California Institute of Technology. March 25, 1944.
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- M1** Drag characteristics of various aircraft rocket pro-

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M1 Deflection of a rotating rocket due to mal-launching. Theoretical curves showing yaw, orientation and deflection of 3.5" SSR, 5.0" HCSR and 5.0" HVSR during burning. (Report No. CIT/JPC-20 and Supplement.) Leverett Davis, Jr. and L. Ivan Epstein. OEMsr-418; Service Project Nos. NO-33 and NO-215; OSRD No. 2188. California Institute of Technology. August 10 and December 30, 1944.

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M5 Note on range and dispersion of 5.0" HVAR, Model 13. (Local Intermediate Report No. CIT/IBC-74.) H. M. Greene and Leverett Davis, Jr. California Institute of Technology. March 27, 1945.

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- M1** Thermodynamic properties of British flashless and cordite MD powders. (Progress Report No. A-82.) F. T. McClure, D. W. Osborne and Joseph O. Hirschfelder. OEMsr-51; Project Nos. PA-230, OD-26 and others; OSRD No. 817. Carnegie Institution of Washington. August 24, 1942.
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- M1** Design of a fast-burning propellant grain for the barrage rocket motor. (Report No. CIT/JDC-41.) Bruce H. Sage. OEMsr-418. California Institute of Technology. March 30, 1943.
- M2** Design of a chemical warfare rocket grain for the 3.25" Mark 5 motor. (Report No. CIT/IDC-34.) Quentin Elliott. OEMsr-418. California Institute of Technology. August 5, 1943.
- M3** Effect of dimensions on performance of tubular grains for 2.25" rocket motors. (Report No. CIT/JDC-59.) Bruce H. Sage. OEMsr-418; Service Project No. NO-33. California Institute of Technology. January 27, 1944.
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- M1** Development of a triform grain for 3.25-inch rocket motors. (Report No. CIT/JDC-79.) Bruce H. Sage. OEMsr-418; Service Project Nos. OD-14 and NO-33; OSRD No. 2535. California Institute of Technology. September 14, 1945.
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- M1** Design of a cruciform charge for the 3.25" rocket motor. (Report No. CIT/JDC-46.) Bruce H. Sage. OEMsr-418. California Institute of Technology. July 19, 1943.
- M2** Development of the Mark 13 cruciform propellant grain. (Report No. CIT/JDC-56.) Bruce H. Sage. OEMsr-418; Service Project Nos. OD-26 and NO-33. California Institute of Technology. December 29, 1943.
- M3** Development of a 24-lb cruciform charge for the 5.0-inch rocket motor. (Report No. CIT/JDC-62.) Bruce H. Sage. OEMsr-418; Service Project No.

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- M4** The relation of column strength to the ballistic performance of Mark 13 grains. (Report No. Ms-840/JDC-87.) Bruce H. Sage. OEMsr-418. California Institute of Technology. December 15, 1945.

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- M2** Development of a hexaform propellant grain for 3.25" rocket motors. (Report No. Ms-820/IDC-44.) Bruce H. Sage. OEMsr-418. California Institute of Technology. February 1, 1946.

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- M1** Remarks on the use of double-base powder in jet-propelled devices. (Memorandum No. A-40M.) Charles C. Lauritsen. Service Project No. OD-26; OSRD No. 404. February 24, 1942.
- M2** Development of jet-propulsion powders. C. W. Gault. OEMsr-416. Hercules Powder Company, Inc. July 1, 1943.
- M3** Investigation of JPH propellant lots FDAP-28 and FDAP-29. (Report No. CIT/JDC-74.) Bruce H. Sage. OEMsr-418; Service Project Nos. OD-14 and NO-33; OSRD No. 2517. California Institute of Technology. June 5, 1945.
- M4** The effect of extrusion pressure on the degree of consolidation of JPN propellant. (Report No. Ms-843/JDC-88.) Bruce H. Sage. OEMsr-418. California Institute of Technology. November 15, 1945.
- M5** Drying characteristics and the effect of water on the physical characteristics and ballistic performance of JPH and JPN propellants. (Report No. Ms-835/JDC-90.) Bruce H. Sage. OEMsr-418. California Institute of Technology. November 15, 1945.

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- M2** The design of granulation for rocket powder. (Report No. A-150.) John Beek, Jr. Service Project Nos. OD-14, OD-26 and others; OSRD No. 1264. National Bureau of Standards. February 25, 1943.
- M3** Testing powder grains for fissures with special emphasis on non-visual methods. (Report No. A-173.) Farrington Daniels and Robert E. Wilfong. OEMsr-762; Service Project Nos. OD-14, OD-26 and others; OSRD No. 1362. University of Wisconsin. April, 1943.

- M4** A less regressive design for powder grains. Beatrice Kelly, F. T. McClure and J. Barkley Rosser. Theoretical study of the validity of a certain method of determining a burning law. Beatrice Kelly, R. B. Kershner and others. (Memorandum Nos. A-75M and A-76M.) OEMsr-273; Service Project Nos. OD-14, CWS-22 and others; OSRD No. 2069. George Washington University. November, 1943.

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- M1** Pressure distribution along radially-burning propellant grains. (Report No. CIT/JDC-14.) Bruce H. Sage. OEMsr-418. California Institute of Technology. August 10, 1942.
- M2** Pressure distribution along radially-burning propellant grains. (Progress Report No. A-84.) (n.a.) OEMsr-418; Project Nos. NO-33, PA-310 and others. California Institute of Technology. August 25, 1942.
- M3** Influence of size of the axial perforation upon the performance of radially-burning grains. (Report No. CIT/JDC-19.) Bruce H. Sage. OEMsr-418. California Institute of Technology. September 21, 1942.

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- M1** The extrusion of the UP propellant. (Interim Report No. CIT/JDC-1.) Thomas L. Lauritsen. Research Project No. PDRC-155. California Institute of Technology. December 15, 1941.
- M2** Extrusion and burning characteristics of two types of colloidal propellant. (Report No. CIT/JDC-35.) Bruce H. Sage. OEMsr-418. California Institute of Technology. January 12, 1943.
- M3** Well colloided, solvent-process powder for solventless extrusion. (Report No. CIT/JDC-64.) Bruce H. Sage. OEMsr-418; Service Project No. NO-33; OSRD No. 2173. California Institute of Technology. July 7, 1944.
- M4** Powder trapping and the extrusion of rocket powders. Robert Burns. OEMsr-256; Project Nos. P-70 and OD-14; OSRD No. 6159. Bell Telephone Laboratories, Inc. January 3, 1946.

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- M1** Thermodynamic properties of propellant gases. An extension and revision of NDRC Report No. A-48, OSRD No. 547. (Progress Report No. A-116.) Joseph O. Hirschfelder, F. T. McClure and others. OEMsr-51; Project Nos. PA-230, OD-52 and others; OSRD No. 1087. Carnegie Institution of Washington. November 25, 1942.

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- M1** The compressive characteristics of several propellants determined at a constant rate of stress application. (Report No. CIT/JDC-80.) Donald S. Clark. OEMsr-418; OSRD No. 2534. California Institute of Technology. October 11, 1945.
- M2** The use of the ultimate strength as determined in a simple compression test as a measure of JP propellant quality of Mark 13 grains. (Report No. Ms-834/JDC-89.) Bruce H. Sage. OEMsr-418. California Institute of Technology. December 1, 1945.

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- M2** Determination of energies of explosion of propellant powders. (Final Report No. P-6.) J. J. Donovan, L. F. Gonyea and H. Fritz. OEMsr-273; Service Project Nos. OD-14 and NO-33; OSRD No. 5841. George Washington University. June, 1946.

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- M2** Extrusion and burning characteristics of powders of the dinitrotoluene and cordite types. (Memorandum No. A-71M, as of January 12, 1943.) Bruce H. Sage. OEMsr-418; Service Project Nos. OD-14, OD-26 and others. California Institute of Technology. March, 1943.
- M3** Determination of the linear burning rates of propellants from pressure measurements in the closed chamber. Lyman G. Bonner. OEMsr-733; Service Project Nos. OD-14, OD-52 and others; OSRD No. 4382. Duke University. November 30, 1944.
- M4** Investigations on the burning characteristics of propellant powder and their effects upon steady-state pressure in rocket motors. (Report No. Ms-821/JDC-84.) Bruce H. Sage. OEMsr-418. California Institute of Technology. November 1, 1945.
- M5** Determination of burning rates from pressure-time relations in closed chambers. (Final Report

No. P-1.3.) Lyman G. Bonner. OEMsr-273; Project Nos. OD-14, NO-33 and P-31; OSRD No. 5816. George Washington University. December, 1945.

- M6** The restriction of powder burning. (Final Report No. P-4.) Amos Turk, Lyman G. Bonner and others. OEMsr-273; Service Project Nos. NO-33 and OD-14; OSRD No. 5834. George Washington University. December, 1945.

- M7** Determination of the burning rates of certain powders by the strand technique. (Report No. P-1.2.) J. J. Donovan, L. F. Gonyea and H. Fritz. OEMsr-273; Project Nos. NO-33, OD-14 and P-32; OSRD No. 5833. George Washington University. June, 1946.

360 Types of Propellants

361 Double-Base Powders

- M1** History of solventless extrusion of double-base propellant at the California Institute of Technology. (Report No. CIT/IDC-43.) Bruce H. Sage. OEMsr-418. California Institute of Technology. March 1, 1945.

361.1 Manufacture of Double-Base Powders

- M1** Inspection and testing of a 7/8-inch stick powder. (Progress Report No. A-78.) John Beek, Jr. OEMsr-256, OEMsr-337 and OEMsr-416; Service Project Nos. OD-14, OD-26 and others; OSRD No. 769. George Washington University, Bell Telephone Laboratories, Inc. and Hercules Powder Company, Inc. August 4, 1942.
- M2** Dry extrusion of double-base powder at Indian Head. (Part I. Progress Report No. A-123.) Howard E. Higbie. OEMsr-273; Project Nos. OD-14, PA-330 and others; OSRD No. 1100. George Washington University. December 11, 1942.
- M3** Dry extrusion of double-base powder at Indian Head. Part II, Extrusion of solventless sheet powder of the Russian formulation. (Report No. A-133.) Howard E. Higbie. OEMsr-273, OEMsr-256 and OEMsr-416; Service Project Nos. OD-14, OD-26 and others; OSRD No. 1226. George Washington University, Bell Telephone Laboratories, Inc. and Hercules Powder Company, Inc. February 5, 1943.
- M4** Preparation of double-base propellant for solventless extrusion. (Report No. CIT/JDC-39.) Bruce H. Sage. OEMsr-418. California Institute of Technology. March 1, 1943.
- M5** Extrusions of double-base powder at Indian Head. (Report No. A-203.) G. F. Padgett. OEMsr-273; Service Project Nos. OD-14, OD-26 and others; OSRD No. 1658. George Washington University. July, 1943.
- M6** The extrusion of dried, solvent processed, double-base powder at Indian Head. (Report No. A-220.) Howard E. Higbie. OEMsr-273; Service Project Nos. OD-14, OD-26 and others; OSRD No. 1886. George Washington University. September, 1943.

- M7** Propellant processing, igniter construction and motor loading facilities. (Report No. CIT/JDC-45, as of January 1, 1943.) Bruce H. Sage. OEMsr-418. California Institute of Technology. November 24, 1943.
- M8** A method of analysis for gas-phase mixtures of acetone, water and air. (Report No. CIT/IDC-40.) Bruce H. Sage. OEMsr-418; Service Project Nos. NO-33 and OD-26. California Institute of Technology. March 13, 1944.
- M9** Further investigation of partially colloided double-base powder in solventless extrusion. (Report No. CIT/JDC-65.) Bruce H. Sage. OEMsr-418; Service Project No. NO-33; OSRD No. 2205. California Institute of Technology. August 16, 1944.
- M10** A pilot plant for the manufacture of double-base propellant by a modified solvent process. (Report No. CIT/JDC-70.) Bruce H. Sage. OEMsr-418; Service Project Nos. OD-14 and NO-33; OSRD No. 2372. California Institute of Technology. December 1, 1944.

361.2 Properties of Double-Base Powders

- M1** Thermodynamic properties of special double-base powders. (Progress Report No. A-107.) D. W. Osborne, F. T. McClure and Joseph O. Hirschfelder. OEMsr-273; Project Nos. OD-14, PA-310 and others; OSRD No. 1014. George Washington University. November 16, 1942.
- M2** Some physical properties of double-base powders. (Report No. CIT/JDC-51.) Bruce H. Sage. OEMsr-418. California Institute of Technology. October 12, 1943.

361.21 Burning Characteristics

- M1** Extrusion and burning characteristics of a special propellant. (Report No. CIT/JDC-29.) Bruce H. Sage. OEMsr-418. California Institute of Technology. September 15, 1942.
- M2** The mechanism of powder burning. (Report No. A-243.) (n.a.) OEMsr-762; Service Project Nos. OD-26, OD-14 and others; OSRD No. 3206. University of Wisconsin. January, 1944.
- M3** Observations on the burning of double-base powders. (Report No. A-268.) Bryce L. Crawford, Jr., Clayton Huggett and John J. McBrady. OEMsr-716; Service Project Nos. OD-26, OD-14 and others; OSRD No. 3544. University of Minnesota. April, 1944.
- M4** Studies of the mechanism of burning of double-base rocket propellants. (Final Report No. A-485.) Farrington Daniels, R. E. Gluyas and others. OEMsr-762; Service Project Nos. OD-14 and NO-33; OSRD No. 6559. University of Wisconsin. January, 1945.
- M5** Erosive burning of double-base powders. (Report No. P-1.1.) R. J. Thompson and F. T. McClure. OEMsr-273; Project Nos. OD-14, NO-33 and P-23; OSRD No. 5831. George Washington University. December, 1945.

- M6** Burning rate studies of double-base powders. (Report No. P-1.) William H. Avery, Roy E. Hunt and M. N. Donin. OEMsr-273; Project Nos. OD-14, P-10.1 and others; OSRD No. 5827. George Washington University. January, 1946.

361.211 Effects of Temperature and Pressure

- M1** Effect of pressure and temperature on the rate of burning of double-base powders of different compositions. (Report No. A-225.) William H. Avery and Roy E. Hunt. OEMsr-273; Service Project Nos. OD-14, OD-26 and others; OSRD No. 1993. George Washington University. October, 1943.
- M2** Revisions and corrections to NDRC Formal Report No. A-225: Effect of pressure and temperature on the rate of burning of double-base powders of different compositions. (ABL-WPR Supplement No. 6.) William H. Avery, Roy E. Hunt and L. D. Sachs. [OEMsr-273;] OSRD No. 4568. [George Washington University.] December 23, 1944.
- M3** Effect of pressure and temperature on the rate of burning of double-base powders of different compositions. (Part II. ABL-WPR Supplement No. 9.) William H. Avery, Roy E. Hunt and L. D. Sachs. OEMsr-273; OSRD No. 4942. George Washington University. March 3, 1945.
- M4** Effects of pressure and temperature on the rate of burning of double-base powders of different compositions. (Report No. P-1.4.) William H. Avery, Roy E. Hunt and L. D. Sachs. OEMsr-273; Service Project Nos. OD-14, OD-26 and others; OSRD No. 5824. George Washington University. March, 1946.

361.212 Effects of Radiation and Fissuring

- M1** Some effects of radiation upon double-base powder. (Report No. CIT/JDC-11.) (n.a.) OEMsr-418. California Institute of Technology. June 15, 1942.
- M2** Some effects of radiation upon double-base powder. (Report No. A-79.) (n.a.) OEMsr-418; Service Project Nos. OD-14, OD-26 and others. California Institute of Technology. August 7, 1942.
- M3** The fissuring of translucent double-base powders at low pressures. (Progress Report No. A-93.) Alfred Africano. Project Nos. NO-33, PA3-10 and others; OSRD No. 888. September 15, 1942.
- M4** The ignition by radiation and fissuring of double-base powders. (Report No. A-171.) Bryce L. Crawford, Jr., Clayton Huggett and others. OEMsr-716; Service Project Nos. OD-26, OD-14 and others; OSRD No. 1370. University of Minnesota. April, 1943.

361.213 Effects of Ethyl Centralite

- M1** Extrusion and burning characteristics of a double-base propellant employing ethyl centralite as stabilizer. (Report No. CIT/JDC-26.) Bruce H.

Sage. OEMsr-418. California Institute of Technology. November 23, 1942.

- M2** Effects of ethyl centralite, potassium nitrate and various coloring agents on the burning characteristics of double-base propellant. (Report No. A-137.) Bruce H. Sage. OEMsr-418; Service Project Nos. OD-14, OD-26 and others. California Institute of Technology. January 13, 1943.

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- M1** The rate of burning of double-base powders and the possible effects of change in nitroglycerin and total-volatiles content on the burning of jet-propulsion tube powder. (Progress Report No. A-102.) R. E. Gibson. Service Project Nos. OD-14, OD-26 and others; OSRD No. 943. October 16, 1942.
- M2** Effect of nitrocellulose source upon the characteristics of double-base powder. (Report No. CIT/JDC-28.) Bruce H. Sage. OEMsr-418. California Institute of Technology. December 15, 1942.
- M3** Effect of nitrocellulose source upon the characteristics of double-base powder. (Report No. A-155, as of December, 1942.) Bruce H. Sage. OEMsr-418; Service Project Nos. NO-33, NO-99 and others. California Institute of Technology. March, 1943.
- M4** Heats of combustion of celluloses and nitrocelluloses. (Report No. A-285.) Ralph S. Jessup and Edward J. Prosen. Service Project Nos. OD-14 and NO-33; OSRD No. 3932. National Bureau of Standards. July, 1944.
- M5** Rate of diffusion of nitroglycerin through cellulose acetate. (Report No. CIT/JDC-68.) Bruce H. Sage. OEMsr-418; Service Project Nos. OD-14 and NO-33; OSRD No. 2365. California Institute of Technology. January 1, 1945.
- M6** Diffusion of nitroglycerin in wrapped powder grains. (ABL-WPR Supplement No. 11.) S. S. Penner and Seymour Sherman. OEMsr-273; OSRD No. 4963. George Washington University. June 5, 1945.

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- M1** Some effects of composition, powder temperature and radiation on the rate of burning of double-base powders. (Memorandum No. A-65M.) William H. Avery. Service Project Nos. OD-14, CWS-22 and others; OSRD No. 1156. January 11, 1943.

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- M1** A review of the available literature on the mechanism of combustion of double-base powders. (Report No. A-130.) Bryce L. Crawford, Jr. and Clayton Huggett. OEMsr-716; Service Project Nos. OD-14, OD-26 and others; OSRD No. 1188. University of Minnesota. February 3, 1943.
- M2** Determination of ignition temperatures of double-base powders. (Report No. A-200.) Bryce L. Crawford, Jr. and Herbert S. Isbin. OEMsr-716; Serv-

ice Project Nos. OD-26, OD-14 and others; OSRD No. 1713. University of Minnesota. July, 1943.

361.23 Corrosive Effect

- M1** Corrosive effect of solutions of double-base powder on various metals. (Report No. CIT/JDC-58.) Bruce H. Sage. OEMsr-418; Service Project No. NO-33. California Institute of Technology. January 11, 1944.

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- M1** A comparison of the specific impulse of four double-base rocket propellants. (Report No. P-3.1.) John Beek, Jr. and John P. Rappolt. OEMsr-273; Project Nos. NO-33, OD-14 and 811; OSRD No. 5829. George Washington University. December, 1945.

361.25 Impact

- M1** Impact characteristics of several double-base propellants. (Report No. Ms-836/JDC-86.) Bruce H. Sage. OEMsr-418. California Institute of Technology. December 10, 1945.

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- M1** Tests of cemented ball-powder charges. (Progress Report No. A-98.) M. Walker and Alfred Africano. OEMsr-273; Project Nos. NO-33, PA-310 and others; OSRD No. 920. George Washington University. September, 1942.
- M2** Measurements of pH on double-base powders. (Report No. A-151.) Robert B. Corey, Charlotte Green and Henri A. Levy. OEMsr-702; Service Project Nos. OD-14, CWS-22 and others; OSRD No. 1265. California Institute of Technology. February 26, 1943.
- M3** Heats of combustion and formation of diethylphthalate, dibutylphthalate, dinitrotoluene, diethyldiphenylurea and nitroguanidine. (Report No. A-197.) Edward J. Prosen, Roger Gilmont and Frederick D. Rossini. Project Nos. OD-26, CWS-22 and others; OSRD No. 1590. National Bureau of Standards. July, 1943.
- M4** Characteristics of double-base propellants containing nigrosine and carbon black. (Report No. CIT/JDC-43.) Bruce H. Sage. OEMsr-418. California Institute of Technology. July 16, 1943.
- M5** An investigation of nickel-catalyzed powder. (Report No. Ms-844/JDC-94.) Bruce H. Sage. OEMsr-418. California Institute of Technology. December 15, 1945.
- M6** Free and restricted column behavior of some double-base propellants. (Report No. Ms-838/JDC-92.) Bruce H. Sage. OEMsr-418. California Institute of Technology. December 30, 1945.

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- M1** Investigations of double-base powders. (Final report.) Linus C. Pauling. OEMsr-702. California Institute of Technology. January, 1943.

- 361.31 Chromatographic**
- M1** X-ray studies of double-base powder. Chromatographic studies of irradiated Radford sheet powder. Treatments to improve burning characteristics of extruded tubes. (Report No. CIT/JDC-23.) Robert B. Corey, A. L. LeRosen and others. OEMsr-250; Research Project No. PDRC-155. California Institute of Technology. July 31, 1942.
- M2** Chromatographic studies of double-base powders. (Part I. Report No. A-132.) Robert B. Corey, R. B. Escue and others. OEMsr-702; Service Project Nos. OD-14, OD-26 and others; OSRD No. 1152. California Institute of Technology. January 2, 1943.
- 361.32 Spectrophotometric**
- M1** Investigations of double-base powders. (Part I. Spectrophotometric studies. (Progress Report No. A-124.) Robert B. Corey, Albert O. Dekker and A. M. Soldate. OEMsr-702; Project Nos. OD-14, PA-330 and others; OSRD No. 1103. California Institute of Technology. December 16, 1942.
- M2** Investigations of double-base powders. Part II. Spectrophotometric studies. (Report No. A-194.) Robert B. Corey, Albert O. Dekker and A. M. Soldate. OEMsr-702; Service Project Nos. OD-14, CWS-22 and others; OSRD No. 1558. California Institute of Technology. June, 1943.
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- M1** Certain special methods for the chemical analysis of double-base powder. (Report No. P-6.1.) J. J. Donovan. OEMsr-273; Project Nos. OD-14, NO-33 and P-62; OSRD No. 5842. George Washington University. December, 1945.
- 361.4 Smokeless Powder**
- 361.41 Manufacture**
- M1** Dry extrusion of powder at Allegany Ballistics Laboratory. (Report No. P-7.) G. F. Padgett and Howard E. Higbie. OEMsr-273; Project Nos. OD-14, NO-33 and P-70; OSRD No. 5844. George Washington University. December, 1945.
- 361.42 Examination and Testing**
- M1** Microscopic structure and the development of flaws in extruded grains of NT smokeless powder. (Progress Report No. A-117.) Charles Proffer Saylor. Project Nos. OD-14, PA-330 and others; OSRD No. 1070. National Bureau of Standards. November 26, 1942.
- M2** Microscopic examination of extruded smokeless powders. (Progress Report No. A-127.) Charles Proffer Saylor. Project Nos. OD-14, PA-330 and others; OSRD No. 1136. National Bureau of Standards. December 23, 1942.
- M3** X-ray diffraction studies of molecular orientation in double-base smokeless powders made by the solvent and solventless processes. (Progress Report No. A-128.) Henri A. Levy. OEMsr-702; Project Nos. OD-14, PA-330 and others; OSRD No. 1151. California Institute of Technology. December 26, 1942.
- 361.5 Ballistite**
- 361.51 Properties of Ballistite**
- M1** Some physical properties of ballistite. (Interim Report No. CIT/JDC-2.) William N. Lacey and Bruce H. Sage. Research Project No. PDRC-155. California Institute of Technology. December 27, 1941.
- M2** Thermodynamic properties of products of reaction of ballistite. (Report No. CIT/JDC-4.) Bruce H. Sage and William N. Lacey. OSRD No. 495. California Institute of Technology. February 4, 1942.
- M3** Diffusion of air in ballistite. (Report No. CIT/JDC-6.) Bruce H. Sage and William N. Lacey. OEMsr-250. California Institute of Technology. February 10, 1942.
- M4** Some physical properties of ballistite. (Report No. A-104.) William N. Lacey and Bruce H. Sage. OEMsr-250; Service Project Nos. OD-14, OD-26 and others. California Institute of Technology. October 21, 1942.
- M5** Some studies of the physical properties of ballistite. (Report No. CIT/JDC-36.) Donald S. Clark. OEMsr-418. California Institute of Technology. February 11, 1943.
- M6** Simple calculation of thermochemical properties for use in ballistics. Addenda to NDRC Report No. A-101, OSRD No. 935. (Memorandum Nos. A-67M to A-70M.) Joseph O. Hirschfelder and Jack Sherman. OEMsr-51; Service Project Nos. OD-52 and NO-23. Carnegie Institution of Washington. March, 1943.
- M7** An investigation of the dispersion of double-base powder in acetone-water mixtures. (Report No. CIT/JDC-49.) Bruce H. Sage. OEMsr-418. California Institute of Technology. September 7, 1943.
- M8** The effect of processing operations and of elevated temperatures upon the diphenylamine content of ballistite. (Report No. CIT/JDC-66.) Bruce H. Sage and Linus C. Pauling. OEMsr-418; Service Project No. NO-33; OSRD No. 2298. California Institute of Technology. September 29, 1944.
- M9** Compressive, torsional and shear characteristics of some double-base propellants. (Report No. Ms-827/JDC-81.) Bruce H. Sage. OEMsr-418. California Institute of Technology. November 1, 1945.
- 361.511 Burning Characteristics**
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- M2** A study of the uniformity of burning character-

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M3 The influence of extrusion and subsequent storage upon the burning characteristics of ballistite. (Report No. CIT/JDC-15.) Bruce H. Sage. OEMsr-418. California Institute of Technology. June 1, 1942.

M4 Burning characteristics in the axial perforations of extruded ballistite grains. (Report No. CIT/JDC-13.) Bruce H. Sage. OEMsr-418. California Institute of Technology. July 30, 1942.

M5 The influence of extrusion and subsequent storage upon the burning characteristics of ballistite. (Report No. A-96.) Bruce H. Sage. OEMsr-418; Service Project Nos. OD-14, OD-26 and others. California Institute of Technology. September 24, 1942.

M6 Effect of coloring agents upon the burning characteristics of ballistite. (Report No. CIT/JDC-25.) Bruce H. Sage. OEMsr-418. California Institute of Technology. December 11, 1942.

M7 Extrusion and burning characteristics of three types of modified ballistite. (Report No. CIT/JDC-40.) Bruce H. Sage. OEMsr-418. California Institute of Technology. March 11, 1943.

M8 Extrusion and burning characteristics of several modified ballistites. (Report No. CIT/JDC-42.) Bruce H. Sage. OEMsr-418. California Institute of Technology. April 7, 1943.

M9 Extrusion and burning characteristics of several types of modified ballistite. (Report No. A-183.) Bruce H. Sage. OEMsr-418; Service Project Nos. OD-14, OD-26 and others. California Institute of Technology. May, 1943.

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M3 Comparative behavior of ballistite from Kenvil and Radford. (Report No. CIT/JDC-21.) Bruce H. Sage. OEMsr-418. California Institute of Technology. October 14, 1942.

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M2 Static firing tests on large-diameter grains of extruded ballistite. (Report No. CIT/JDC-12.) Bruce H. Sage. OEMsr-418. California Institute of Technology. July 30, 1942.

M3 Burning characteristics in the axial perforations of extruded ballistite grains. (Progress Report No. A-83.) Bruce H. Sage. OEMsr-418; Project Nos. NO-33, PA-310 and others; OSRD No. 815. California Institute of Technology. August, 1942.

M4 Testing of quality of small grains of extruded ballistite. (Report No. CIT/JDC-17.) Bruce H. Sage. OEMsr-418. California Institute of Technology. August 20, 1942.

M5 Testing of small grains of extruded ballistite. (Report No. A-94.) Bruce H. Sage. OEMsr-418; Service Project Nos. OD-14, OD-26 and others; OSRD No. 896. California Institute of Technology. September 21, 1942.

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M7 Influence of size of the axial perforation upon the performance of radially-burning propellant grains. (Progress Report No. A-106.) Bruce H. Sage. OEMsr-418; Project Nos. PA-310, NO-33 and others; OSRD No. 966. California Institute of Technology. October 28, 1942.

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M9 Spontaneous decomposition of a ballistite grain. (Report No. CIT/JDC-54.) Bruce H. Sage. OEMsr-418. California Institute of Technology. November 20, 1943.

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M11 Exudation of nitroglycerin from ballistite propellant grains. (Report No. CIT/JDC-78.) Bruce H. Sage. OEMsr-418; OSRD No. 2532. California Institute of Technology. September 8, 1945.

361.52 Extrusion of Solventless Ballistite

M1 The extrusion of ballistite dyed with nigrosine. (Report No. CIT/JDC-34.) Bruce H. Sage. OEMsr-418. California Institute of Technology. January 21, 1943.

M2 Effect of extrusion conditions on the quality of solventless ballistite. (Report No. CIT/JDC-73.) Bruce H. Sage. OEMsr-418; Service Project Nos. OD-14 and NO-33; OSRD No. 2380. California Institute of Technology. January 10, 1945.

361.521 Extrusion Press

M1 A vacuum press for the extrusion of solventless double-base ballistite for use in rockets. (Progress Report No. A-36.) Jesse W. M. DuMond. Service Project Nos. OD-14, OD-26 and CWS-22; OSRD No. 466. March 20, 1942.

M2 Investigation of the effectiveness of flash protection afforded by process storage compartments. (Report No. CIT/IDC-32.) Bruce H. Sage. OEMsr-418. California Institute of Technology. July 10, 1943.

M3 A 12-inch vertical press for extrusion of ballistite. (Report No. CIT/JDC-53.) Bruce H. Sage. OEMsr-418; Service Project Nos. OD-26 and NO-33. California Institute of Technology. October 26, 1943.

M4 Ignition within a twelve-inch vertical extrusion press. (Report No. CIT/JDC-71.) (n.a.) OEMsr-418; Service Project Nos. OD-14 and NO-33; OSRD No. 2348. California Institute of Technology. November 24, 1944.

361.522 Extrusion Die

M1 Design of dies for the extrusion of solventless ballistite. (Report No. CIT/JDC-44.) Bruce H. Sage. OEMsr-418. California Institute of Technology. May 29, 1943.

M2 Changes in the spider design in the extrusion dies used at Indian Head. (Memorandum No. A-72M.) Howard E. Higbie. OEMsr-273; Service Project Nos. OD-14, CWS-22 and others; OSRD No. 1623. George Washington University. July, 1943.

361.523 Extrusion Tubes

M1 Extrusion of ballistite tubing and rod. (Progress Report No. A-35.) Bruce H. Sage and William N. Lacey. OEMsr-250; Service Project Nos. OD-14, OD-26 and CWS-22. California Institute of Technology. March 10, 1942.

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M2 Extrusion of large tubular grains of ballistite. (Report No. A-135.) Bruce H. Sage. OEMsr-418; Service Project Nos. NO-33, NO-99 and others. California Institute of Technology. January 6, 1943.

M3 Development of a propellant grain for use in a 2-inch reaction chamber. (Report No. CIT/JDC-37.) Bruce H. Sage. OEMsr-418. California Institute of Technology. February 10, 1943.

M4 Extrusion of multiweb grains of ballistite. (Report No. CIT/JDC-38.) Bruce H. Sage. OEMsr-418. California Institute of Technology. February 18, 1943.

M5 Extrusion of multiweb grains of ballistite. (Report No. A-176, as of February 18, 1943.) Bruce H. Sage. OEMsr-418; Service Project Nos. OD-14, OD-26 and others. California Institute of Technology. April, 1943.

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M1 The use of ballistite turnings in primers. (Progress Report No. A-56.) Bruce H. Sage and William N. Lacey. OEMsr-250; Project Nos. NO-33, PA-330 and others. California Institute of Technology. May 14, 1942.

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M1 Effect of relative humidity on the water content of black powder. (Report No. CIT/JCC-7.) Bruce H. Sage. OEMsr-418. California Institute of Technology. May 5, 1943.

M2 The investigation of a high-strength propellant. (Report No. CIT/JDC-67.) Bruce H. Sage. OEMsr-418; Service Project Nos. OD-14 and NO-33; OSRD No. 2364. California Institute of Technology. November 7, 1944.

- M3** Formulation of manufacturing specification for solid propellants. (Report No. P-9.) Raymond L. Arnett. OEMsr-273; Project Nos. NO-33, OD-14 and P-90; OSRD No. 5851. George Washington University. November, 1945.
- M4** Miscellaneous propellant studies. [Part] I, Investigation of some special propellant charge designs. [Part] II, The utilization of magnesium as a rocket fuel. (Report No. P-10.) Lyman G. Bonner, Sidney Golden and W. P. Spaulding. OEMsr-273; Service Project Nos. NO-33, OD-14 and others; OSRD No. 5852. George Washington University. December, 1945.
- M5** Preliminary development work on the utilization of Western Cartridge small arms powder for rocket propellant. (Report No. Ms-845/JDC-95.) Bruce H. Sage. OEMsr-418. California Institute of Technology. December 15, 1945.
- M6** X-ray diffraction photograph investigations of sheet powder. W. O. Baker and N. R. Pape. OEMsr-256; Service Project Nos. OD-14 and OD-163; OSRD No. 6169. Bell Telephone Laboratories, Inc. December 20, 1945.

370 Propellant Influences on Rocket Design

(See also: 230)

- M1** Rockets for cast propellants. N. R. Droulard, William W. Farr and W. B. Pope. OEMsr-968; Project Nos. W-50 and OD-26; OSRD No. 6132. Budd Wheel Company. October 17, 1945.
- M2** High-performance rocket design studies. N. R. Droulard, William W. Farr and W. B. Pope. OEMsr-968; Service Project No. OD-26; OSRD No. 6140. Budd Wheel Company. October 17, 1945.
- M3** Ballistic characteristics and rocket design data for extruded composite propellants. An addendum to . . . OSRD No. 5576. (Report No. P-10.1.) Rufus W. Lumry and L. N. Streff. OEMsr-273 and OEMsr-202; Service Project No. OD-14; OSRD No. 5624. George Washington University and Carnegie Institute of Technology. December, 1945.

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- M1** Rocket design and production problems. Metal parts. (Part 4. Weekly and Bi-Weekly Progress Report Nos. CIT/PMC-2.27, -2.38, -2.48, -2.62, -2.69, -2.84 and -2.85 [for the] periods ending April 9, June 25, September 3, December 10, 1944, January 28, June 24 and July 8, 1945.) T. Gardner. OEMsr-418; OSRD Nos. 2130, 2202, 2309, 2362, 2480 and 2489. California Institute of Technology.
- M2** Miscellaneous development of rockets and accessories. N. R. Droulard, William W. Farr and W. B. Pope. OEMsr-968; Service Project Nos. OD-26, OD-165 and NO-248; OSRD No. 6152. Budd Wheel Company. October 17, 1945.
- M3** Production of metal components of rockets. Kenneth L. Wentworth, John Fawcett and others.

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- M1** Influence of burning time, mass velocity and tube wall thickness on the heat failure of rocket tubes. (Local Intermediate Report No. CIT/IAC-6.) (n.a.) California Institute of Technology. January 20, 1943.
- M2** A study of certain hazards involved in the loading and assembly of rocket motors. (Report No. CIT/JDC-48.) A. D. Ayers. OEMsr-418. California Institute of Technology. July 15, 1943.
- M3** A delay element for use with rocket motors. John P. Wooley. Catalyst Research Corporation. September 28, 1943.
- M4** Vibration testing of rocket motors. (Report No. CIT/JDC-60.) Bruce H. Sage. OEMsr-418; Service Project No. NO-33. California Institute of Technology. February 17, 1944.
- M5** The effective temperatures of rocket motors with cruciform grains. (Report No. CIT/JNC-22.) Leverett Davis, Jr., F. E. Roach and J. M. Schmidt. OEMsr-418; Service Project Nos. OD-162, OD-164 and NO-170; OSRD No. 2176. California Institute of Technology. August 5, 1944.
- M6** Design and performance of an installation for the temperature conditioning of motors for static firing. (Report No. CIT/JGC-9.) Bruce H. Sage. OEMsr-418; OSRD No. 2501. California Institute of Technology. June 1, 1945.
- M7** The design of metal components for rocket motors. (Final Report No. B-5.) H. C. Stumpf and George W. Engstrom. OEMsr-273; Project Nos. NO-33 and W-6; OSRD No. 5891. George Washington University. December, 1945.
- M8** Investigation of fiberglass laminates as materials for rocket motors. (Final Report No. B-5.1.) John Beek, Jr. and James F. Kincaid. OEMsr-273; Research Project No. B-5.2; OSRD No. 5893. George Washington University. December, 1945.

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- M1** Design of box grids. (Local Intermediate Report No. CIT/IAC-4.) Sylvan Rubin. California Institute of Technology. November 6, 1942.

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- M2** Effects of weathering and immersion on the closure seals of rocket motors. (Report No. CIT/JDC-55.) Bruce H. Sage. OEMsr-418; Service Project No. NO-33. California Institute of Technology. November 20, 1943.
- M3** Intensified exposure of motor seals. (Report No. CIT/JDC-76.) Bruce H. Sage. OEMsr-418; Serv-

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- M4** Closures and seals for rocket motors. (Report No. CIT/IAC-19.) Bruce H. Sage. OEMsr-418. California Institute of Technology. November 19, 1945.

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- M1** Investigation of a proposed liquid carbon dioxide rocket. (ABL-WPR Supplement No. 5.) Alfred Africano and F. T. McClure. OEMsr-273; OSRD No. 4487. George Washington University. December 2, 1944.

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- M2** The dependence of the masses of rocket components on their dimensions. (Report No. A-149.) Leverett Davis, Jr. OEMsr-418; Service Project Nos. OD-26, CWS-22 and NO-33. California Institute of Technology. February 24, 1943.
- M3** The dependence of the mass of propellant in a rocket motor on the web thickness and the motor dimensions. (Report No. CIT/JAC-4.) Leverett Davis, Jr. and Chester D. Mills, Jr. OEMsr-418. California Institute of Technology. February 25, 1943.
- M4** Dependence of the mass of propellant in a rocket motor on the web thickness and the motor dimensions. (Report No. A-163.) Leverett Davis, Jr. and Chester D. Mills, Jr. OEMsr-418; Service Project Nos. OD-26, CWS-22 and NO-33. California Institute of Technology. March, 1943.

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- M2** The 6-inch rocket motor. (Report No. CIT/JAC-3.) Earl Thomas. OEMsr-418. California Institute of Technology. November 9, 1942.
- M3** Some factors entering into the design of high-performance rockets. (Local Intermediate Report No. CIT/IAC-5.) E. Ellis and F. E. Roach. California Institute of Technology. January 10, 1943.
- M4** Manual [of] manufacturing methods for 3.25" rocket motor, Mark 7 and 3.5" rocket body, Mark 1. (Report No. CIT/JSC-2.) (n.a.) OEMsr-418; Service Project No. NO-170. California Institute of Technology. January 20, 1944.
- M5** Temperature gradient in the tubing of the 3.25" rocket motor, Mark 7. (Local Intermediate Report No. CIT/ILC-5.) F. E. Roach, J. M. Schmidt and W. F. Nash, Jr. California Institute of Technology. May 22, 1944.

- M6** Manual [of] inspection procedures for 11.75" rocket motor, Mark 1. (Report No. CIT/JSC-9.) (n.a.) OEMsr-418; Service Project No. NO-256; OSRD No. 2311. California Institute of Technology. November 22, 1944.

- M7** Specifications for standard assembly [of the] 5.0" rocket motor, California Institute of Technology Model 38, 5-MA5. (Report No. CIT/IAC-17.) M. C. Pond. OEMsr-418. California Institute of Technology. May 29, 1945.

- M8** Design and development of the 11.75-inch rocket motor. (Report No. CIT/IBC-75.) C. W. Snyder. California Institute of Technology. November 6, 1945.

- M9** The bumblebee rocket motor. (Final Report No. W-22.) S. S. Penner. OEMsr-273 and NOrd-7386; Project Nos. NO-296 and W-221; OSRD No. 5821. George Washington University and Johns Hopkins University. December, 1945.

- M10** Development of rocket motor for 115-mm aircraft rocket. (Final Report No. W-8.2.) George W. Engstrom and Alexander Kossiakoff. OEMsr-273; Project Nos. W-82, OD-161 and NO-245; OSRD No. 5785. George Washington University. June, 1946.

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- M2** Description of an igniter for mousetrap propellant. (Report No. CIT/ICC-1.) (n.a.) OEMsr-418. California Institute of Technology. August 10, 1942.
- M3** Preliminary investigation of metal-oxidant igniters for ballistite. (Report No. CIT/JCC-6.) Bruce H. Sage. OEMsr-418. California Institute of Technology. February 25, 1943.
- M4** Assembly operations for bayonet igniter, Model No. 2. (Memorandum No. A-88M.) J. W. Burns. OEMsr-273 and OEMsr-256; Service Project Nos. OD-26, NO-33 and others; OSRD No. 3429. George Washington University and Bell Telephone Laboratories, Inc. March, 1944.
- M5** Development of a toroid igniter for application in the 3.25" spin-stabilized rocket motor, Mark 13. (Report No. Ms-831/ICC-3.) Bruce H. Sage. OEMsr-418. California Institute of Technology. November 15, 1945.

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- M1** Effect of squib boosters on the performance of black powder igniters. (Report No. CIT/JCC-9.) Bruce H. Sage. OEMsr-418. California Institute of Technology. August 14, 1943.
- M2** Performance tests on electric squibs and rocket igniters after storage at elevated temperatures. (Report No. CIT/JCC-10.) Bruce H. Sage.

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422 Igniter Cases

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- M2** Investigation of the use of plastic case igniters for the antisubmarine projector charge (ASPC) motor. (Report No. CIT/JCC-5.) Bruce H. Sage. OEMsr-418. California Institute of Technology. January 7, 1943.
- M3** A preliminary investigation of plastic cases for igniters for ballistite. (Report No. A-138.) Bruce H. Sage. OEMsr-418; Service Project Nos. OD-14, OD-26 and others. California Institute of Technology. January 21, 1943.
- M4** Investigation of the use of plastic case igniters for the antisubmarine projector charge (ASPC) motor. (Report No. A-158.) Bruce H. Sage. OEMsr-418; Service Project Nos. OD-14, OD-26 and others. California Institute of Technology. March, 1943.
- M5** Development of cellulose acetate igniter cases for 1.25" and 2.25" rocket motors. (Report No. CIT/JCC-8.) Bruce H. Sage. OEMsr-418. California Institute of Technology. August 12, 1943.
- M6** Threaded closure plastic case igniters for 2.25" rocket motors. (Report No. CIT/JCC-11.) Bruce H. Sage. OEMsr-418. California Institute of Technology. March 16, 1944.

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- M2** Catalog of California Institute of Technology rocket fuzes. (Report No. CIT/UIC-3.) (n.a.) OEMsr-418. California Institute of Technology. January 15, 1944.
- M3** Special fuzes for rockets, projector charges and miscellaneous munitions. (Ordnance Pamphlet No. 1017. First Revision.) (n.a.) US Navy Department. June 13, 1944.
- M4** Rocket base fuzes, Mark 162, Model 0 and Mark 166, Model 0. (Report No. CIT/JIC-2.) (n.a.) OEMsr-418; Service Project Nos. NO-170 and NO-256. OSRD No. 2492. California Institute of Technology. July 20, 1945.

M5 Rocket fuzes. R. B. King, V. K. Rasmussen and others. OEMsr-418; OSRD No. 2545. California Institute of Technology. 1946.

M6 Point-initiating base-detonating electromagnetic fuze, T-2003. (Divisions 3 and 8. Final Report No. W-6.1.) F. T. McClure, D. D. Miller and others. OEMsr-273, OEMsr-256 and OEMsr-202; Service Project No. OD-163; OSRD No. 5881. George Washington University and Bell Telephone Laboratories, Inc. March, 1946.

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M1 The Mark 140 fuze, HIR-3. Tests of arming depth, premature firing and sensitivity. (Local Intermediate Report No. CIT/IIC-18.) (n.a.) California Institute of Technology. September 1, 1943.

432 PIR Fuzes

M1 Characteristics of the PIR fuze. (Preliminary Report No. CIT/JIC-1.) Thomas L. Lauritsen, J. G. Waugh and J. Rasmussen. OEMsr-418. California Institute of Technology. August 3, 1942.

M2 [The] Mark 146 fuze, PIR. Static firing progress report. (Local Intermediate Report No. CIT/IIC-21.) D. E. Brink. California Institute of Technology. March 18, 1944.

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M2 Tests of SIR, Mark 139 fuze, February 27 to April 27, 1943. (Local Intermediate Report No. CIT/IIC-14.) (n.a.) California Institute of Technology. April, 1943.

M3 Tests of preliminary firing mechanisms for SIR fuze. (Report No. CIT/IIC-8.) Bruce H. Rule and W. P. Huntley. California Institute of Technology. (n.d.)

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M1 Heat transfer to nozzles used in jet-propulsion equipment. (Report No. CIT/JDC-20.) Bruce H. Sage. OEMsr-418. California Institute of Technology. September 30, 1942.

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M4 Methods for one-piece nozzle manufacture. (Report No. CIT/JSC-4.) (n.a.) OEMsr-418; Service Project No. NO-170. California Institute of Technology. March 8, 1944.

M5 Methods for one-piece nozzle manufacture. (Report No. CIT/JSC-4. Supplement No. 1.) (n.a.) OEMsr-418. California Institute of Technology. May 16, 1944.

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M1 A study of nozzle erosion. (Local Intermediate Report No. CIT/IGC-7.) (n.a.) California Institute of Technology. March 8, 1944.

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M3 Nozzle erosion in the 3-MR3 rocket motor determined from static firing records. (Local Intermediate Report No. CIT/IAC-14.) N. U. Mayall. California Institute of Technology. August 7, 1944.

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M1 The California Institute of Technology aircraft rocket sight, Type 2. (Report No. CIT/JNC-23.) H. W. Babcock. OEMsr-418; Service Project No. NO-216; OSRD No. 2263. California Institute of Technology. October 15, 1944.

M2 Revised sighting tables [for the] F4U-1D and F4U-4 aircraft, 11.75-inch aircraft rocket. (Report No. CIT/JNC-29. Revision No. 3.) (n.a.) California Institute of Technology. August 15, 1945.

M3 Rocket sight, aircraft, California Institute of Technology Type 4. (Report No. CIT/JNC-33.) H. W. Babcock, J. L. Fuller and others. OEMsr-418; OSRD No. 2526. California Institute of Technology. August 25, 1945.

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M1 Rocket powder traps. N. R. Droulard, William W. Farr and W. B. Pope. OEMsr-968; Service Project No. OD-26; OSRD No. 6147. Budd Wheel Company. October 17, 1945.

470 Firing Ring

M1 Single shroud rocket tail with internal insulated firing ring. (Report No. CIT/IBC-11.) L. A. Richards. California Institute of Technology. January 22, 1943.

480 Fins

M1 Fin opening. (Report No. A-247.) J. Barkley Rosser. OEMsr-723; Service Project Nos. OD-26 256. OSRD No. 2492. California Institute of Technology. July 20, 1945.

M2 The development of rocket fins and lug band kits for use with the flush-mount launcher on aircraft. (Final Report No. W-18.4.) George W. Engstrom and R. I. Beddoe. OEMsr-273; Project Nos. W-80.26 and OD-161; OSRD No. 5787. George Washington University. February, 1946.

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M1 California Institute of Technology launcher catalog. (Report No. CIT/JEC-14.) (n.a.) OEMsr-418. California Institute of Technology. February 7, 1944.

M2 Tip-off about a fixed point. (Report No. CIT/OPC-3.) Wallace Hayes. California Institute of Technology. November 17, 1944.

M3 Rocket terminal ballistics. Facilities at Naval Ordnance Test Station, Inyokern, and test results to April 15, 1945. (Report No. CIT/JQC-1.) J. E. Thomas. OEMsr-418; OSRD No. 2525. California Institute of Technology. August 10, 1945.

M4 Rocket launchers. N. R. Droulard, William W. Farr and W. B. Pope. OEMsr-968; Project Nos. W-180.4, W-70 and OD-26; OSRD No. 6134. Budd Wheel Company. October 17, 1945.

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Types of Launchers

491.1

Aircraft, Mounted On

M1 Vertical rocket launcher for airplanes. (Memorandum No. A-80M.) R. F. Mallina. OEMsr-256; Service Project Nos. OD-26 and NO-34.1; OSRD No. 3082. Bell Telephone Laboratories, Inc. January, 1944.

M2 Manual [of the] description and use of the 11.75" aircraft rocket, Model 3 from F4U-1D aircraft with displacement launcher. (Report No. CIT/JEC-21.) (n.a.) OEMsr-418; Service Project No. NO-256; OSRD No. 2313. California Institute of Technology. December 15, 1944.

M3 Booster launcher for testing of aircraft rockets. (Report No. W-18.1.) M. J. Walker. OEMsr-273; Research Project No. W-180.3; OSRD No. 5812. George Washington University. October, 1945.

M4 Rocket launchers for use on aircraft. J. M. Dietz, C. A. Hasslacher and J. H. Mogler. OEMsr-256; Project Nos. W-180.2 and OD-26; OSRD No. 6162. Bell Telephone Laboratories, Inc. January 3, 1946.

491.2

Land and Sea

M1 Rocket launchers for surface use. Paul E. Lloyd. OEMsr-418; OSRD No. 2548. California Institute of Technology. 1946.

491.21 Land

M1 Jungle launchers. (Memorandum No. A-81M.) R. F. Mallina. OEMsr-256; Service Project Nos. OD-26 and CWS-22; OSRD No. 3083. Bell Telephone Laboratories, Inc. January, 1944.

491.211 JB-2 Launcher

- M1** Multiple powder charge launcher for JB-2. N. R. Droulard, William W. Farr and W. B. Pope. OEMsr-968; Service Project Nos. OD-196 and NA-231; OSRD No. 6141. Budd Wheel Company. October 17, 1945.
- M2** A multiple-cartridge launcher for the JB-2. (Final Report No. W-20.) R. B. Kershner, C. F. Curtiss and others. OEMsr-273; OSRD No. 5818. George Washington University. January, 1946.

491.212 Jeep, Mounted On

- M1** Description and use of barrage rocket launcher, California Institute of Technology Type 2, for 1/4-ton 4 x 4 truck. (Report No. CIT/JEC-10.) (n.a.) OEMsr-418. California Institute of Technology. July 2, 1943.
- M2** Assembly and installation of barrage rocket launcher, California Institute of Technology Type 2, for 1/2-ton 4 x 4 truck. (Report No. CIT/JEC-10.2.) (n.a.) OEMsr-418. California Institute of Technology. July 24, 1943.

491.213 Trailer, Mounted On

- M1** Manual [of] description and instructions for use [of the] California Institute of Technology Type 44 launcher for 5.0" spin-stabilized rocket. (Report No. CIT/JEC-19.) (n.a.) OEMsr-418; Service Project Nos. OD-167 and NO-215; OSRD No. 2349. California Institute of Technology. January 18, 1944.

491.214 Tanks, Mounted On

- M1** Ripple firing mechanism for launching rockets. D. D. Miller and T. H. Guettich. OEMsr-256; Service Project No. OD-26; OSRD No. 6158. Bell Telephone Laboratories, Inc. February 9, 1946.

491.22 Sea

- M1** [The] 7.2" rocket launchers, Mark 20 [and] Mark 22, and ammunition. (Ordnance Pamphlet No. 1002. First Revision.) (n.a.) US Navy Department. November 30, 1943.
- M2** Manual [of] description and instructions for use [of the] California Institute of Technology Type 31-C, shipboard launcher. (Report No. CIT/JEC-17.) H. A. Meneghelli. OEMsr-418; Service Project No. NO-192; OSRD No. 2167. California Institute of Technology. July 15, 1944.
- M3** Description and instructions for use of Mark 35, Model 0 launcher, California Institute of Technology Type 46-B. (Report No. CIT/JEC-22.) (n.a.) OEMsr-418; OSRD No. 2407. California Institute of Technology. March 15, 1945.
- M4** Description and instructions for use [of the] rocket launcher Mark 50, Models 0 and 1. (Report No. CIT/JEC-23.) (n.a.) OEMsr-418; OSRD No. 2422. California Institute of Technology. April 2, 1945.
- M5** Closed-breech SR rocket launcher, California In-

stitute of Technology Types 38 and 56. (Report No. CIT/JEC-25.) (n.a.) OEMsr-418; Service Project Nos. OD-167 and NO-215; OSRD No. 2457. California Institute of Technology. April 30, 1945.

491.221 PT Boats, Mounted On

- M1** Rocket firing from PT boats. (Report No. CIT/JEC-18.) (n.a.) OEMsr-418; OSRD No. 2206. California Institute of Technology. September 7, 1944.
- M2** Rocket firing from PT boats, ATB, Ft. Pierce, Florida. (Report No. CIT/JEC-24.) Paul E. Lloyd. OEMsr-418; Service Project Nos. OD-167 and NO-215; OSRD No. 2345. California Institute of Technology. January 13, 1945.

491.23 Amphibious**491.231 DUKW, Mounted On**

- M1** Manual [of] description and instructions for use [of the] California Institute of Technology Type 6, Model 1 launcher for the 4.5" barrage rocket, 120-barrel for 2 1/2-ton 6 x 6 amphibious truck, DUKW. (Report No. CIT/JEC-13.) (n.a.) OEMsr-418. California Institute of Technology. November 10, 1943.
- M2** Manual [of] description and instructions for use [of the] California Institute of Technology Type 7, Model 1 launcher for 7.2" rockets, 42-rail for 2 1/2-ton 6 x 6 amphibious truck, DUKW. (Report No. CIT/JEC-15.) A. S. Gould. OEMsr-418; Service Project Nos. OD-26, OD-137 and NO-121. California Institute of Technology. February 4, 1944.
- M3** Manual [of] description and instructions for use [of the] California Institute of Technology Type 6, Model 1 launcher for the 4.5" barrage rocket, 120-barrel for 2 1/2-ton 6 x 6 amphibious truck, DUKW. (Report No. CIT/JEC-13.2.) (n.a.) OEMsr-418. California Institute of Technology. March 20, 1944.

491.232 4.5-Inch Barrage Rocket

- M1** Manual [of] description and instructions for use [of the] California Institute of Technology Type 8 and Type 8, Model 1 launcher for 4.5" barrage rocket. (Report No. CIT/JEC-11.2.) (n.a.) OEMsr-418. California Institute of Technology. October 14, 1942.
- M2** California Institute of Technology Type 1, Model 1 launcher, single-rail 4.5" barrage rocket. (Report No. CIT/JEC-8.) (n.a.) OEMsr-418. California Institute of Technology. June 26, 1943.
- M3** California Institute of Technology Type 3 launcher, wooden 3-rail for 4.5" barrage rocket. (Report No. CIT/JEC-9.) (n.a.) OEMsr-418. California Institute of Technology. July 1, 1943.
- M4** California Institute of Technology Type 3 firing box. (Report No. CIT/JEC-9.2.) (n.a.) OEMsr-

418. California Institute of Technology. July 22, 1943.

M5 California Institute of Technology Type 8 launcher for 4.5" barrage rocket. (Report No. CIT/JEC-11.) (n.a.) OEMsr-418. California Institute of Technology. August 4, 1943.

M6 Manual [of] instructions for use of California Institute of Technology Type 3 launcher, wooden 3-rail for 4.5" barrage rocket, and CIT Type 3 firing box. (Report No. CIT/JEC-9.3.) (n.a.) OEMsr-418. California Institute of Technology. November 17, 1943.

M7 Manual [of] description and instructions for use [of the] 4.5" rocket launcher, Mark 7, California Institute of Technology Type 8. (Report No. CIT/JEC-11.3.) L. A. Richards. OEMsr-418; Service Project No. NO-118. California Institute of Technology. March 27, 1944.

M8 Manual [of] description and instructions for use [of the] California Institute of Technology Type 9 rocket launcher, extensible single-rail 4.5" barrage rocket. (Report No. CIT/JEC-16.) (n.a.) OEMsr-418; Service Project No. NO-118. California Institute of Technology. May 5, 1944.

M9 Spiral launching of 4.5-inch rockets. (Report No. W-18.2.) R. R. Newton. OEMsr-273; Research Project No. W-180.4; OSRD No. 5813. George Washington University. December, 1945.

M10 Launchers and improved components for 4.5-inch rockets. J. M. Dietz, R. F. Mallina and others. OEMsr-256; Project Nos. W-40, OD-165 and others; OSRD No. 6156. Bell Telephone Laboratories, Inc. February 9, 1946.

491.233 Mark 17 Launcher

M1 Rocket launchers, Mark 17 and Mark 17, Model 1. Formerly designated rocket launchers, Mark 1 target, and Mark 1, Model 1 target. Description and instructions for use. (Ordnance Pamphlet No. 1133.) (n.a.) US Navy Department. August 30, 1944.

491.234 Mark 51 Launcher

M1 Manual [for] use of rocket launcher Mark 51, Model 0, twelve-round automatic for 5.0" spin-stabilized rockets. (Report No. CIT/JEC-20.) (n.a.) OEMsr-418; Service Project Nos. OD-167 and NO-215; OSRD No. 2281. California Institute of Technology. November 13, 1944.

M2 Rocket launcher, Mark 51, Model 0. (Report No. CIT/JEC-26.) (n.a.) OEMsr-418; Service Project Nos. OD-167 and NO-215; OSRD No. 2448. California Institute of Technology. April 25, 1945.

492 Projectors

M1 A projector for target rockets. (Report No. CIT/JEC-1.) William R. Smythe. Research Project No. PDRC-155. California Institute of Technology. January 15, 1942.

M2 The antisubmarine rocket projector. (Report No.

CIT/JEC-3x.) William R. Smythe. OEMsr-250. California Institute of Technology. April 27, 1942.

M3 The antisubmarine rocket projectile and projector. Part I, The rocket projectile. Part II, The rocket projector. (Progress Report No. A-50, as of April 27, 1942.) Thomas L. Lauritsen and William R. Smythe. Service Project Nos. OD-26 and CWS-22. May 5, 1942.

M4 A twelve-channel projector for the chemical warfare bomb, CWB. (Report No. CIT/JEC-5.) Jesse W. M. DuMond. OEMsr-418. California Institute of Technology. June 15, 1942.

M5 Firing mechanism for the 7-inch chemical rocket projector. (Report No. A-187.) R. F. Mallina and P. T. Higgins. OEMsr-256; Service Project No. CWS-22; OSRD No. 1484. Bell Telephone Laboratories, Inc. May, 1943.

M6 Light-weight rocket projectors. (Memorandum No. A-89M.) R. F. Mallina and J. M. Dietz. OEMsr-256; Service Project Nos. OD-26 and CWS-22; OSRD No. 3446. Bell Telephone Laboratories, Inc. March, 1944.

492.1 Vertical Bombing Projectors

M1 Loading of vertical bombing projectors and preparation of ammunition. (Report No. CIT/JEC-6.) (n.a.) OEMsr-418. California Institute of Technology. January 6, 1943(?)

M2 Loading of vertical bombing projectors for PBV-5 aircraft and preparation of 205 ft/sec ammunition. Crew manual. (Report No. CIT/JEC-6.2.) (n.a.) OEMsr-418. California Institute of Technology. May 1, 1943.

M3 Loading of vertical bombing projectors for TBF-1 and TBF-2 aircraft and preparation of 300 ft/sec ammunition. (Report No. CIT/JEC-7.) (n.a.) OEMsr-418. California Institute of Technology. June 9, 1943.

M4 Loading of retrobombing projectors for PBV-5 aircraft and preparation of 200 ft/sec ammunition. Crew manual. (Report No. CIT/JEC-6.3.) (n.a.) OEMsr-418. California Institute of Technology. August 14, 1943.

492.2 Barrage Rocket Projectors

M1 Projector for the 4½-inch barrage rocket. (Report No. CIT/JEC-4.) (n.a.) [California Institute of Technology.] July 25, 1942.

M2 Installation of barrage rocket projector. Excerpts from Report No. CIT/JBC-10.2. (Report No. CIT/JBC-10.3.) (n.a.) California Institute of Technology. September 18, 1942.

M3 Installation and use of barrage rocket projectors for tank lighters. (Report No. CIT/JBC-16.) (n.a.) OEMsr-418. California Institute of Technology. May 28, 1943.

500 ROCKET AND MISSILE TYPES

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510 California Institute of Technology Rockets

- M1** California Institute of Technology rockets. (Report No. CIT/UBC-1.) (n.a.) OEMsr-418. California Institute of Technology. November 18, 1942.
- M2** California Institute of Technology rocket weapons and test facilities. An illustrated record. (Report No. CIT/JBC-14.) (n.a.) OEMsr-418. California Institute of Technology. February 1, 1943.
- M3** Ammunition catalogue [of] California Institute of Technology rockets. (Report No. CIT/JBC-20.) (n.a.) OEMsr-418. California Institute of Technology. August 10, 1943.

520 Barrage Rockets

- M1** Manual [for the] use of [the] 4.5-inch barrage rocket. (Report No. CIT/JBC-10.) Thomas L. Lauritsen, R. Lindvall and L. A. Richards. OEMsr-418. California Institute of Technology. August 1, 1942.
- M2** The 4.5-inch barrage rocket. (Progress Report No. A-85.) F. Fredericks, Thomas L. Lauritsen and others. OEMsr-418; Project Nos. PA-366, NO-36.5 and others. OSRD No. 842. August 27, 1942.
- M3** Manual [for the] use of [the] 4.5-inch barrage rocket. (Report No. CIT/JBC-10.2. Revised.) (n.a.) OEMsr-418. California Institute of Technology. September 10, 1942.
- M4** Training of barrage rocket crews. (Report Nos. CIT/JBC-10.4 and CIT/JBC-10.5.) William A. Fowler, W. F. Royal and L. A. Richards. OEMsr-418. California Institute of Technology. September 23 and 29, 1942.
- M5** Investigation M-7. Development of 4½" rocket. (Report No. 3-135.) William W. Farr. OEMsr-671. Budd Wheel Company. [1943(?)]
- M6** Supplement to investigation M-7. Operation drawings. (n.a.) OEMsr-671. Budd Wheel Company. [1943(?)]
- M7** Tests of lateral dispersion of barrage rocket with various nozzles, November 24, 1942 to January 14, and January 30 to February 5, 1943. (Local Intermediate Report Nos. CIT/IBC-14 and -19.) J. G. Waugh and L. A. Richards. California Institute of Technology. January and February, 1943.
- M8** Gas malalignment and deflection-malalignment ratio for all types of barrage rockets fired from September 20, 1942 to April 1, 1943. (Local Intermediate Report No. CIT/IBC-23.) C. W. Snyder. California Institute of Technology. April, 1943.
- M9** Manual [of the] use of 4.5-inch barrage rocket.

(Report No. CIT/JBC-10.6. Second Edition.) (n.a.) OEMsr-418. California Institute of Technology. April 7, 1943.

- M10** Manual [of] methods of manufacture for the 4.5" barrage rocket. (Report No. CIT/JSC-1.) Lowell Martin. OEMsr-418. California Institute of Technology. September 22, 1943.
- M11** Manual for the 4.5" barrage rocket, 1100 yard. (Report No. CIT/JBC-19.2. Second Edition.) (n.a.) OEMsr-418. California Institute of Technology. October 10, 1943.
- M12** [The] 115-mm rocket. N. R. Droulard, William W. Farr and W. B. Pope. OEMsr-968; Project Nos. W-80, OD-161 and NO-245; OSRD No. 6139. Budd Wheel Company. October 17, 1945.

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Fragmentation

- M1** Barrage rocket fragmentation. (Report No. CIT/IQC-1.) O. C. Wilson. California Institute of Technology. July 7, 1943.
- M2** Comparison of fragmentation of the 4.5" barrage rocket with the 105-mm howitzer shell. (Local Intermediate Report No. CIT/IQC-2.) O. C. Wilson, C. A. Wirtanen and J. A. Gilbert. California Institute of Technology. July 30, 1943.
- M3** Fragmentation tests on special barrage rocket bodies. (Local Intermediate Report No. CIT/IQC-3.) O. C. Wilson, C. A. Wirtanen and J. A. Gilbert. California Institute of Technology. August 19, 1943.

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Parachute Drops

- M1** Barrage rocket parachute drops. (Local Intermediate Report No. CIT/IBC-53.) J. E. Thomas and Paul E. Lloyd. California Institute of Technology. October 20, 1943.
- M2** Barrage rocket parachute drops. (Local Intermediate Report No. CIT/IBC-57.) Paul E. Lloyd and R. D. Ridgeway. California Institute of Technology. December 6, 1943.

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Aircraft Rockets

- M1** Airborne rockets. (Part 2. Weekly and Bi-Weekly Progress Report Nos. CIT/PMC-2.38, -2.48, -2.49, -2.53, -2.62, -2.69, -2.84, -2.85 and -2.87 [for the] periods ending June 25, September 3, 10, October 8, December 10, 1944, January 28, June 24, July 8 and August 5, 1945.) William A. Fowler. OEMsr-418; OSRD Nos. 2128, 2200, 2208, 2238, 2307, 2360, 2478, 2487, and 2506. California Institute of Technology.
- M2** Developments in 11.75" aircraft rocket. (Report No. CIT/LMC-1.17. Confidential Bulletin No. 17.) (n.a.) OEMsr-418; OSRD No. 2406. California Institute of Technology. March 1, 1945.
- M3** Principles of rocket firing from aircraft. (Report No. CIT/JNC-30.) (n.a.) OEMsr-418; Service Project No. NO-170; OSRD No. 2428. California Institute of Technology. April 2, 1945.
- M4** Firing of rockets from aircraft. Launchers, sights

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and flight tests. R. V. Adams, C. D. Anderson and others. OEMsr-418; OSRD No. 2549. California Institute of Technology. 1946.

531 Types

531.1 2.25-Inch Rockets

- M1** Manual [of] inspection procedures for 2.25" aircraft rocket, Model 3 subcaliber [with] 2.25" rocket motor, Mark 12 and 2.25" rocket body, Mark 1. (Report No. CIT/JSC-6.) (n.a.) OEMsr-418; Service Project No. NO-170; OSRD No. 2119. California Institute of Technology. May 30, 1944.
- M2** The 2.25" subcaliber aircraft rockets, Models 1 and 3. (Report No. CIT/JBC-30.) (n.a.) OEMsr-418; Service Project No. NO-227; OSRD No. 2305. California Institute of Technology. November 20, 1944.

531.2 3.5-Inch Rockets

- M1** Manual [of] inspection procedures for 3.5" aircraft rocket, Model 5 [with] 3.25" rocket motor, Mark 7 and 3.5" rocket body, Mark 1. (Report No. CIT/JSC-5.) (n.a.) OEMsr-418; OSRD No. 2110. California Institute of Technology. April 29, 1944.
- M2** Brief history of the development of the 3.5" aircraft rocket. (Report No. CIT/JBC-25.) (n.a.) OEMsr-418. California Institute of Technology. May 10, 1944.
- M3** Development of the 3.5" aircraft rocket, Models 1, 5 and 14. (Report No. CIT/JBC-26.) (n.a.) OEMsr-418; Service Project Nos. NO-164 and NO-170; OSRD No. 2107. California Institute of Technology. June 1, 1944.
- M4** Trajectories of aircraft rockets 3.5" and 5.0". (Report No. CIT/UBC-27.) (n.a.) OEMsr-418; Service Project Nos. OD-162 and NO-170; OSRD No. 2225. California Institute of Technology. September 25, 1944.

531.3 4.5-Inch Rockets

- M1** A 4½-inch high-explosive rocket shell for projection from airplanes. (Progress Report No. A-70.) C. N. Hickman and L. A. Skinner. Project Nos. OD-26, NO-34.1 and PA-341; OSRD No. 673. July 3, 1942.
- M2** Improvement of components for 4.5-inch rocket, M-8. (Final Report No. W-4.) D. W. Osborne and B. Weissmann. OEMsr-273; Project Nos. W-40, NO-248 and others; OSRD No. 5777. George Washington University. December, 1945.
- M3** The 115-mm aircraft rocket. (Final Report No. W-8.) R. E. Gibson and Alexander Kossiakoff. OEMsr-273; Project Nos. W-80, OD-161 and NO-245; OSRD No. 5781. George Washington University. June, 1946.

531.4 11.75-Inch Rockets

- M1** Forward firing of 11.75-inch aircraft rockets from

F4U-1D and F6F-5 aircraft. (Report No. CIT/JNC-29. Tentative edition and revisions.) (n.a.) OEMsr-418; OSRD No. 2357. California Institute of Technology. January 27, 1945.

- M2** Forward firing of 11.75-inch aircraft rockets from A-26B aircraft. (Report No. CIT/JNC-32.) (n.a.) OEMsr-418; OSRD No. 2433. California Institute of Technology. July 1, 1945.

- M3** Land service use of 11.75-inch aircraft rockets against caves. (Report No. CIT/JBC-32.) (n.a.) OEMsr-418; OSRD No. 2516. California Institute of Technology. August 15, 1945.

531.5 Trajectories

- M1** Trajectory data for 7.2" VAR, 200 ft/sec, PBY-5. (Report No. CIT/JNC-4.2, Supplement.) (n.a.) OEMsr-418. California Institute of Technology. July 15, 1943.
- M2** Trajectories of aircraft rockets. (Report No. CIT/UBC-35.) (n.a.) OEMsr-418; Service Project No. NO-170; OSRD No. 2540. California Institute of Technology. January 4, 1946.

531.6 Miscellaneous Aircraft Rockets

- M1** Mechanism of pitch sensitivity for aircraft torpedoes. (Report No. CIT/NOC-47.1. Revised.) Harold Wayland. California Institute of Technology. February 27, 1945.

532 Aircraft Rockets and Missiles for Special Types of Bombing

532.1 Retrobombing

- M1** Retrobombing. A description of projectiles and installations on aircraft. (Report No. CIT/JBC-18.) (n.a.) OEMsr-418. California Institute of Technology. June 23, 1943.
- M2** Retrobombing from B-24 aircraft [using] 300 ft/sec ammunition. (Report No. CIT/JNC-7.) (n.a.) OEMsr-418. California Institute of Technology. August 1, 1943.
- M3** Retrobombing from PBY-5 aircraft [using] 200 ft/sec ammunition. Mark 1 launchers, modified. Squadron VP-91. Officer's manual. (Report No. CIT/JNC-4.4.) (n.a.) OEMsr-418. California Institute of Technology. August 23, 1943.

532.2 Vertical Bombing

- M1** Vertical antisubmarine bomb (VASB) [and] vertical flare (VF). (Report No. CIT/OBC-14.2.) William A. Fowler. OEMsr-418. California Institute of Technology. July 23, 1942.
- M2** Preliminary tests of the vertical bombing of submarines from airplanes. (Preliminary Report No. A-76.) William A. Fowler. OEMsr-418; Project Nos. OD-26, NO-121 and PA-371. California Institute of Technology. July 31, 1942.
- M3** Vertical bombing. (Supplementary Report No. CIT/OBC-14.3.) W. N. Arnquist, C. A. Anderson and F. C. Lindvall. OEMsr-418. California Institute of Technology. August 25, 1942.
- M4** Tests of the vertical bombing of submarines,

August 24 to 26, 1942. (Memorandum No. A-52M.) W. N. Arnquist, C. A. Anderson and F. C. Lindvall. OEMsr-418; Project Nos. OD-26, NO-121 and PA-371; OSRD No. 872. California Institute of Technology. September 9, 1942.

- M5** Vertical bombing. (Supplementary Report No. CIT/OBC-14.4.) C. A. Anderson, W. N. Arnquist and F. C. Lindvall. OEMsr-418. California Institute of Technology. September 12, 1942.

- M6** Additional tests of the vertical bombing of submarines from airplanes, September 3 and 10, 1942. (Memorandum No. A-54M.) C. D. Anderson, W. N. Arnquist and F. C. Lindvall. OEMsr-418; Project Nos. OD-26, NO-121 and PA-371. California Institute of Technology. September 30, 1942.

- M7** Vertical bombing. (Third Report, No. CIT/OBC-14.5.) C. D. Anderson, W. N. Arnquist and others. OEMsr-418. California Institute of Technology. November 25, 1942.

- M8** Vertical bombing from PBY-5 aircraft. Officers' manual. (Report No. CIT/JNC-4.) (n.a.) OEMsr-418. California Institute of Technology. January 19, 1943.

- M9** Vertical bombing. (Report No. A-141, as of November 25, 1942.) (n.a.) OEMsr-418; Service Project Nos. OD-26 and NO-121. OSRD No. 1242. California Institute of Technology. February 5, 1943.

- M10** Vertical bombing from PBY-5 aircraft [using] 205 ft/sec ammunition. Mark 1 projectors. Squadron VP-63. Officers' manual. (Report No. CIT/JNC-4.2.) (n.a.) OEMsr-418. California Institute of Technology. May 1, 1943.

- M11** Vertical bombing from B-18A aircraft [using] 205 ft/sec ammunition. Officers' manual. (Report No. CIT/JNC-4.3.) (n.a.) OEMsr-418. California Institute of Technology. May 15, 1943.

- M12** Vertical bombing from TBF-1 and -2 aircraft [using] 300 ft/sec ammunition. Officers' manual. (Report No. CIT/JNC-5.) (n.a.) OEMsr-418. California Institute of Technology. June 5, 1943.

532.3 Forward Firing

- M1** Abstract of British reports on forward firing from aircraft. (Report Nos. CIT/UMC-7 and CIT/UMC-7.2.) (n.a.) OEMsr-418. California Institute of Technology. August 4 and September 28, 1943.

- M2** Forward firing of rockets from aircraft. (Report No. CIT/JNC-9.) J. C. Renard and T. F. Pollock. US Pacific Fleet, Air Force. October 4, 1943.

- M3** Catalog [of] forward-firing aircraft rockets. (Report No. CIT/JBC-22.) (n.a.) OEMsr-418. California Institute of Technology. November 1, 1943.

- M4** Method of computing trajectories and sighting tables for forward-firing aircraft rockets. (Report No. CIT/JPC-17.) Leon Blitzer and Leverett Davis, Jr. OEMsr-418; Service Project Nos. NO-

33 and NO-170. California Institute of Technology. February 20, 1944.

- M5** Sources of error and dispersion in forward firing of non-rotating aircraft rockets. (Report No. CIT/JPC-19.) Leon Blitzer and Leverett Davis, Jr. OEMsr-418; Service Project Nos. OD-162, NO-164 and others. California Institute of Technology. April 25, 1944.

- M6** Forward firing of rockets from P-47D aircraft. (Report No. CIT/JNC-24.) (n.a.) OEMsr-418; Service Project No. NO-170; OSRD No. 2333. California Institute of Technology. January 2, 1945.

- M7** Forward firing of rockets from P-51K aircraft. (Report No. CIT/JNC-26.) (n.a.) OEMsr-418; Service Project No. NO-170; OSRD No. 2347. California Institute of Technology. February 10, 1945.

- M8** Forward firing of rockets from P-38L aircraft. (Report No. CIT/JNC-25.) (n.a.) OEMsr-418; Service Project No. NO-170; OSRD No. 2382. California Institute of Technology. February 17, 1945.

532.31 Special Rocket Types

- M1** Forward firing of 3.5" aircraft rockets from TBF-1 and PV-1 aircraft. (Report No. CIT/JNC-9.2.) J. C. Renard and T. F. Pollock. OEMsr-418. California Institute of Technology and US Navy, Commander Fleet Air, West Coast. November 6, 1943.

- M2** Forward firing of 3.5" and 5.0" aircraft rockets from TBF-1, PV-1, SBD-5 and F6F-3 aircraft. (Report No. CIT/JNC-9.3.) J. C. Renard and T. F. Pollock. OEMsr-418; Service Project No. NO-170. California Institute of Technology and US Navy, Commander Fleet Air, West Coast. December 31, 1943.

- M3** Forward firing of 5.0", 3.5" and 2.25" aircraft rockets from A-26B aircraft. (Report No. CIT/JNC-28.) (n.a.) OEMsr-418; Service Project No. NO-170; OSRD No. 2449. California Institute of Technology. June 15, 1945.

- M4** Forward firing of 5.0-inch, 3.5-inch and 2.25-inch aircraft rockets from B-25J aircraft. (Report No. CIT/JNC-27.) (n.a.) OEMsr-418; Service Project No. NO-170; OSRD No. 2476. California Institute of Technology. July 15, 1945.

- M5** Forward firing of 11.75-inch aircraft rockets from P-38L aircraft. (Report No. CIT/JNC-34.) (n.a.) OEMsr-418; Service Project No. NO-256; OSRD No. 2499. California Institute of Technology. July 20, 1945.

532.32 Carrier-Based Rockets

- M1** Handling of forward-firing rocket equipment aboard carriers. (Report No. CIT/JNC-13.) (n.a.) US Navy, Commander Fleet Air, West Coast. January 8, 1944.

- M2** Handling of forward-firing rocket equipment

aboard Kaiser-class carriers. (Report No. CIT/JNC-13.2.) (n.a.) OEMsr-418; Service Project No. NO-170. California Institute of Technology. March 28, 1944.

540 Jet-Accelerated Armor-Piercing (AP) Rockets

- M1** Jet acceleration of armor-piercing bombs. (Progress Report No. A-4, as of March 1, 1941.) C. N. Hickman. Service Project No. OD-26; OSRD No. 8. June, 1941.
- M2** Jet acceleration tests of the 14-inch armor-piercing bomb. (Progress Report No. A-69.) C. N. Hickman. Project Nos. OD-26, NO-35.1 and PA-351; OSRD No. 691. July 10, 1942.
- M3** Static tests of the 12-inch jet-accelerated armor-piercing bomb. (Memorandum No. A-55M.) C. N. Hickman. OEMsr-256; Project Nos. OD-26, NO-35.1 and PA-351; OSRD No. 924. Bell Telephone Laboratories, Inc. October 6, 1942.
- M4** The jet-accelerated armor-piercing bomb. (Final Report No. W-1.) C. N. Hickman. OEMsr-273; Project Nos. OD-26, NO-35.1 and W-10; OSRD No. 5761. George Washington University. October 15, 1945.
- M5** [The] 12" jet-accelerated armor-piercing bomb. N. R. Droulard, William W. Farr and W. B. Pope. OEMsr-968; Project Nos. W-10, OD-26 and NO-35.1; OSRD No. 6151. Budd Wheel Company. October 17, 1945.
- M6** Mechanical arming propeller for 12-inch jet-accelerated armor-piercing bomb. R. F. Mallina. OEMsr-256; Project Nos. W-10, OD-26 and others; OSRD No. 6155. Bell Telephone Laboratories, Inc. December 12, 1945.

550 High-Velocity Rockets

551 Types

551.1 2.36-Inch Rockets

- M1** High-explosive antitank 2.36-inch rocket, bazooka. Part I, Historical outline. Part II, Early ballistic studies. (Final Report No. W-3.) C. N. Hickman and Sidney Golden. OEMsr-273; Service Project No. OD-26; OSRD No. 5771. George Washington University. December, 1945.
- M2** The development of the T-12 grenade. (Final Report No. W-3.3.) D. M. Brasted. OEMsr-273; Project Nos. OD-26 and W-30; OSRD No. 5776. George Washington University. December, 1945.
- M3** A study of ignition in the 2.36-inch rocket grenade. (Report No. P-5.) Ray S. Craig and L. D. Sachs. OEMsr-273; Project Nos. OD-14 and P-51; OSRD No. 5837. George Washington University. December, 1945.

551.2 5-Inch Rockets

- M1** Status of the 5.0" HVAR [with] 5.0" motor, as of April 1, 1944. (Local Intermediate Report No. CIT/IBC-64.) C. W. Snyder. California Institute of Technology. April, 1944.

- M2** Manual [of] inspection procedures for 5.0" high-velocity aircraft rocket, Models 13, 14, 15 and 16 [with the] 5.0" rocket motor, Mark 1 and 5.0" rocket body, Mark 5. (Report No. CIT/JSC-7.) (n.a.) OEMsr-418; Service Project Nos. OD-162 and NO-170; OSRD No. 2204. California Institute of Technology. August 28, 1944.
- M3** Manual [of] inspection procedures for 5.0" high-velocity aircraft rocket. Supplement No. 1, Inspection of 5.0" rocket body, Mark 5, Model 1. (Report No. CIT/JSC-7.) (n.a.) OEMsr-418; Service Project Nos. OD-162 and NO-170; OSRD No. 2234. California Institute of Technology. September, 1944.
- M4** Instruction manual [of] optical inspection fixture, Model M-4, 5.0" high-velocity aircraft rocket. (Report No. CIT/JSC-8.) (n.a.) OEMsr-418; Service Project Nos. OD-162 and NO-170; OSRD No. 2236. California Institute of Technology. October 2, 1944.
- M5** Manual [of the] description and use of the 5.0" high-velocity aircraft rocket, Models 13-A and 14-A. (Report No. CIT/JBC-29.) (n.a.) OEMsr-418; Service Project Nos. OD-162, OD-164 and NO-170; OSRD No. 2291. California Institute of Technology. November 14, 1944.

551.3 T-59 Rockets

- M1** The T-59 high-velocity rocket grenade. (ABL-WPR Supplement No. 4.) Sidney Golden, L. E. Morey and W. P. Spaulding. OEMsr-273; OSRD No. 4466. George Washington University. November 25, 1944.
- M2** [The] T-59 high-velocity rocket grenade, super-bazooka. N. R. Droulard, William W. Farr and W. B. Pope. OEMsr-968; Project Nos. W-60, OD-163 and NO-247; OSRD No. 6133. Budd Wheel Company. October 17, 1945.
- M3** [The] T-59 high-velocity rocket grenade, super-bazooka. (Final Report No. W-6.) Sidney Golden, W. P. Spaulding and L. E. Morey. OEMsr-273; Project Nos. W-60, NO-247 and OD-163; OSRD No. 5779. George Washington University. December, 1945.
- M4** The follow-through rocket grenade, T-1. (Final Report No. W-6.2.) W. P. Spaulding and Sidney Golden. OEMsr-273; Project Nos. W-61 and OD-163; OSRD No. 5780. George Washington University. December, 1945.

551.4 Curates

- M1** Small-caliber high-velocity rocket, Curate. (Final Report No. W-21.1.) R. J. Thompson, G. D. Brewer and R. R. Newton. OEMsr-273; Project Nos. OD-201 and W-210; OSRD No. 5820. George Washington University. January, 1946.

551.5 Vicars

- M1** Design of the high-velocity rocket, Vicar. (Final Report No. W-21.) R. J. Thompson and R. R.

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Newton. OEMsr-273; Project Nos. W-210 and OD-201; OSRD No. 5793. George Washington University. December, 1945.

560 Stabilized Rockets

561 Fin-Stabilized

M1 Comparison of fin and rotational stabilization of rockets. (Report No. CIT/JPC-15.) Charles C. Lauritsen. OEMsr-418; Service Project Nos. OD-26, NO-33 and others. California Institute of Technology. January 25, 1944.

M2 The exterior ballistics of fin-stabilized aircraft rockets. (Report No. CIT/JPC-24.) Leon Blitzer and Leverett Davis, Jr. OEMsr-418; OSRD No. 2528. California Institute of Technology. August 20, 1945.

561.1 Dispersion

M1 The dispersion of fin-stabilized rockets. (Report No. CIT/JPC-16.) William A. Fowler. OEMsr-418. California Institute of Technology. January 28, 1944.

M2 The motion of a fin-stabilized rocket during the burning period. (Parts I and II.) ABL-WPR Supplement Nos. 2 and 3.) R. R. Newton and J. Barkley Rosser. OEMsr-273; OSRD Nos. 3960 and 4074. George Washington University. August 5 and 26, 1944.

M3 Dispersion due to malalignment of fin-stabilized rockets in forward firing from aircraft. (Report No. CIT/JPC-23.) L. Ivan Epstein. OEMsr-418; Service Project Nos. OD-16, NO-170 and others; OSRD No. 2190. California Institute of Technology. August 10, 1944.

M4 The relation of manufacturing tolerances to rocket dispersion of fin-stabilized rockets. (Final Report No. B-2.6.) R. R. Newton and Morton Goldman. OEMsr-273; Project Nos. OD-166 and W-80; OSRD No. 5883. George Washington University. December, 1945.

562 Spin-Stabilized

M1 Preliminary calculations on the forward firing of spin-stabilized rocket from airplanes. (Memorandum No. CIT/OBC-41.4.) Leverett Davis, Jr. California Institute of Technology. October 17, 1944.

M2 A note on the reasons why the same spin-stabilized rocket cannot be used both for very accurate fire with a flat trajectory and for barrage purposes. (Memorandum No. CIT/OPC-33.) Leverett Davis, Jr. California Institute of Technology. April 4, 1945.

M3 Range tables for spin-stabilized rockets. (Report No. CIT/JPC-31.) James W. Follin, Jr. and P. W. Stoner. OEMsr-418; Service Project No. NO-215; OSRD No. 2536. California Institute of Technology. November 15, 1946.

562.1 Dispersion

M1 Calculation of mal-launching of spin-stabilized rockets. (Report No. CIT/JPC-22.) Leverett Davis, Jr. and J. G. Waugh. OEMsr-418; Service Project Nos. NO-33 and NO-215; OSRD No. 2235. California Institute of Technology. September 20, 1944.

M2 The effect of aerodynamic moments on the motion of spin-stabilized rockets during burning. (Report No. CIT/JPC-27.) James W. Follin, Jr. OEMsr-418; OSRD No. 2531. California Institute of Technology. September 21, 1945.

562.2 3.5-Inch and 5-Inch Rockets

M1 [Some] 3.5" and 5.0" spin-stabilized rockets. (Report No. CIT/OBC-41.1.) (n.a.) OEMsr-418. California Institute of Technology. October 25, 1944.

M2 Manual [of] inspection procedures for 5.0/5" high-capacity spin-stabilized rocket California Institute of Technology Model 34 [with] 5.0" rocket motor, Mark 4 and 5.0" rocket head, Mark 10. (Report No. CIT/JSC-10.) (n.a.) OEMsr-418; Service Project Nos. OD-167 and NO-215; OSRD No. 2383. California Institute of Technology. January 15, 1945.

M3 Preliminary data [on] 3.5" and 5.0" spin-stabilized rockets. (Report No. CIT/JBC-31.) (n.a.) OSRD No. 2408. California Institute of Technology. March 15, 1945.

M4 Manual [of] inspection procedures for 5.0" spin-stabilized rockets. Supplement No. 1, Inspection of 5.0" rocket head, Mark 8 for 5.0/10" common spin-stabilized rocket, California Institute of Technology Model 32. (Report No. CIT/JSC-10.) (n.a.) OEMsr-418; Service Project No. NO-215; OSRD No. 2421. California Institute of Technology. March 15, 1945.

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Chemical Warfare Bomb (CWB) and Grenade (CWG)

M1 Chemical warfare grenade. (Report No. CIT/IBC-2.) Sylvan Rubin. California Institute of Technology. February 5, 1942.

M2 The chemical warfare grenade. (Progress Report No. A-57, as of May 6, 1942.) R. B. King, Sylvan Rubin and O. C. Wilson. OEMsr-250; Service Project Nos. OD-26 and CWS-22. California Institute of Technology. May 19, 1942.

M3 The chemical warfare grenade, CWG. (Report No. CIT/JBC-6.) R. B. King, Sylvan Rubin and O. C. Wilson. OEMsr-250. California Institute of Technology. May 20, 1942.

M4 The chemical warfare bomb, CWB. (Report No. CIT/JBC-11.) R. B. King and W. H. Sleeper, Jr. OEMsr-418. California Institute of Technology. August 20, 1942.

M5 The chemical warfare bomb. (Progress Report No. A-86.) R. B. King and W. H. Sleeper, Jr. OEMsr-418; Project Nos. PA-363, OD-26 and CWS-22; OSRD No. 866. California Institute of Technology. September 1, 1942.

- 571 **Types**
M1 Comparison of design and performance of 7-inch chemical warfare rocket and 7.2-inch CWR-N. (Local Intermediate Report No. CIT/IBC-47.) Thomas L. Lauritsen. California Institute of Technology. [May, 1943.]
- 572 **Trajectories**
M1 Initial conditions for the calculation of chemical warfare grenade trajectories. (Research Memorandum No. CIT/MTC-2.) Leverett Davis, Jr. California Institute of Technology. March 21, 1942.
M2 Free-flight trajectories of chemical warfare grenade projectiles. (Local Intermediate Report No. CIT/JPC-1.) Leon Blitzer. California Institute of Technology. June 1, 1942.
- 573 **Miscellaneous CWB and CWG Problems**
M1 The theory of the variation with temperature of the dispersion of the chemical warfare grenade, May 1, 1942. (Research Memorandum No. CIT/MTC-4.) Leverett Davis, Jr. California Institute of Technology. May 1, 1942.
M2 Effect of fins on the yaw and deflection of chemical warfare grenades. (Research Memorandum No. CIT/MTC-5.) Leon Blitzer. California Institute of Technology. June 1, 1942.
M3 Accuracy of the CWS-N. (Local Intermediate Report No. CIT/IBC-39.) Clarence E. Weinland, J. W. McConnell and F. W. Thiele. California Institute of Technology. September 25, 1943.
- 580 **Step-Motor Rockets**
M1 Step-motor rockets. N. R. Droulard, William W. Farr and W. B. Pope. OEMsr-968; Project Nos. W-70 and OD-161; OSRD No. 6146. Budd Wheel Company. October 17, 1945.
M2 Step-motor rockets. (Final Report No. W-7.) C. N. Hickman and John M. Woods. OEMsr-273; Service Project Nos. OD-161 and NO-245; OSRD No. 5794. George Washington University. June, 1946.
- 590 **Miscellaneous Rocket Types**
- 591 **Rotating Rockets**
M1 Dispersion of a rotating rocket. (Report No. A-184.) C. H. Dowker. OEMsr-273; Service Project Nos. OD-26, CWS-22 and NO-33. George Washington University. May, 1943.
M2 Tests of rotating Budd 4½-inch rockets. (Report No. A-205.) D. W. Osborne and M. J. Walker. OEMsr-671 and OEMsr-968; Service Project Nos. OD-26, CWS-22 and NO-34.1; OSRD No. 1703. Budd Wheel Company and Budd Induction Heating Company, Inc. August, 1943.
M3 4½" rotated rockets. N. R. Droulard, William W. Farr and W. B. Pope. OEMsr-968; Service Project Nos. OD-26, OD-166 and NO-249; OSRD No. 6148. Budd Wheel Company. October 17, 1945.
- 592 **Rockets for Mine Clearance**
M1 The rocket motor for mine-clearing Snake, M-1. Development and current status. (ABL-WPR Supplement No. 7.) C. A. Boyd and R. H. Bond. OEMsr-273; OSRD No. 4569. George Washington University. December 23, 1944.
M2 Flight ballistics involved in the use of rocket-towed devices. (Final Report No. B-2.4.) Walter J. Harrington. OEMsr-273; Research Project No. W-2; OSRD No. 5888. George Washington University. October, 1945.
M3 The rocket for towing bangalore torpedoes. (Final Report No. W-13.5.) C. A. Boyd and R. H. Bond. OEMsr-273; Project Nos. OD-186 and W-137; OSRD No. 5801. George Washington University. November, 1945.
M4 The rocket for the antipersonnel mine-clearing Snake, M-1. (Report No. W-13.1.) C. A. Boyd and R. H. Bond. OEMsr-273; Project Nos. W-131 and OD-186; OSRD No. 5795. George Washington University. December, 1945.
M5 Investigations of the use of rockets to dispense mine clearing hose. (Report No. W-13.2.) S. D. Brandwein, C. A. Boyd and Walter J. Harrington. OEMsr-273; Project Nos. W-132 and OD-186; OSRD No. 5796. George Washington University. December, 1945.
M6 The rocket for the projected line charge. (Report No. W-13.3.) C. A. Boyd, D. Leenov and Walter J. Harrington. OEMsr-273; Project Nos. W-136 and OD-186; OSRD No. 5799. George Washington University. December, 1945.
M7 Rocket for projecting detonating cable. (Report No. W-13.4.) C. A. Boyd, Walter J. Harrington and D. Leenov. OEMsr-273; Project Nos. W-134 and OD-186; OSRD No. 5798. George Washington University. January, 1946.
- 593 **Special Purpose Rockets**
M1 Rocket-projected special purpose bombs. Part I, Cable bomb. Alfred Africano and J. Barkley Rosser. Part II, Rocket projection of incendiary evaluation bomb. S. Shulman. Part III, Short range rocket-projected demolition bomb. James F. Kincaid. (Final Report No. W-23.) OEMsr-273; Research Project No. W-501; OSRD No. 5822. George Washington University. December, 1945.
M2 Exterior ballistics of the cable-bomb. (Final Report No. B-2.7.) G. L. Gross and J. Barkley Rosser. OEMsr-273; OSRD No. 5884. George Washington University. January, 1946.
- 594 **7.2-Inch Demolition Rockets**
M1 [The] 7.2" demolition rocket. Description and use. (Report No. CIT/JBC-24.) (n.a.) OEMsr-418; Service Project No. OD-137. California Institute of Technology. February 10, 1944.
- 595 **Long-Range High-Altitude Rockets**
M1 Theoretical studies of long-range and high-altitude

rockets. A compilation of memoranda. (Final Report No. B-6.) J. Barkley Rosser, F. T. McClure and others. OEMsr-273; Project Nos. W-0.1, NO-33 and others; OSRD No. 5897. George Washington University. December, 1945.

596 Rockets for Airplane Take-Off

- M1** Rockets for assisted take-off of airplanes. Their use and the prevention of blast injury to the airplane. (Progress Report No. A-119.) Leo Maas, Jr. Project Nos. OD-26, PA-353 and others; OSRD No. 1079. Jet Propulsion Research Laboratory, Indian Head, Maryland. December 2, 1942.

600 EXPERIMENTATION AND TEST EQUIPMENT

610 Tests

- M1** Test facilities and acoustic range at Morris Dam. (Report No. CIT/JHC-1.) Bruce H. Rule. OEMsr-418. California Institute of Technology. October 15, 1942.
- M2** Test facilities and acoustic range at Morris Dam. (Progress Report No. A-118.) Bruce H. Rule. OEMsr-418; Project Nos. PA-365, NO-121 and others. OSRD No. 1082. California Institute of Technology. November 30, 1942.
- M3** Activities of the technical supervisors at the Eaton Canyon Pilot Plant. (Report No. CIT/JDC-77.) J. I. Gates. OEMsr-418; OSRD No. 2530. California Institute of Technology. October 1, 1945.
- M4** Correlation of wind tunnel data on rockets. (Final Report No. B-2.5.) Seymour Sherman and N. G. Gunderson. OEMsr-273; OSRD No. 5882. George Washington University. November, 1945.
- M5** Description of facilities at Eaton Canyon. (Report No. CIT/JDC-82.) René Gorschalki. OEMsr-418; OSRD No. 2537. California Institute of Technology. November 1, 1945.
- M6** Description of facilities at the China Lake Pilot Plant. (Report No. CIT/JDC-83.) René Gorschalki. OEMsr-418; OSRD No. 2553. California Institute of Technology. November 1, 1945.
- M7** Field testing of rockets. Range operations and metric photography. W. N. Arnquist, R. H. Cox and others. OEMsr-418; OSRD No. 2547. California Institute of Technology. 1946.
- M8** Engineering and materiel services. S. R. Avella. OEMsr-256; Service Project Nos. OD-14 and OD-26; OSRD No. 6154. Bell Telephone Laboratories, Inc. January 3, 1946.

611 Pressure

- M1** The use of copper balls for measuring pressures in combustion chambers. (Progress Report No. A-21.) C. N. Hickman. Service Project No. OD-26; OSRD No. 24. November, 1941.
- M2** New equipment for measuring and recording the pressure of powder gases in rocket chambers and the thrusts exerted by blocked rockets, each as a function of time. (Memorandum Nos. A-28M to

A-30M.) Jesse W. M. DuMond. Service Project No. OD-26; OSRD No. 30. November 15, 1941.

- M3** Apparatus for the recording of pressure vs pressure-time curve. (\int Pdt). (ABL-WPR Supplement No. 12.) Sidney Golden and C. M. Lathrop. [OEMsr-273;] OSRD No. 4964. [George Washington University,] June 5, 1945.
- M4** Apparatus for the recording of pressure versus pressure-time curve (\int Pdt). (Final Report No. J-2.) Sidney Golden and C. M. Lathrop. OEMsr-273; Project Nos. OD-14, NO-33 and J-12; OSRD No. 5859. [George Washington University,] December, 1945.
- M5** Miscellaneous experimental electronic pressure recorders for rocket research. (Final Report No. J-2.2.) W. H. Barber and N. E. Alexander. OEMsr-273; Research Project No. J-14; OSRD No. 5865. George Washington University. December, 1945.
- M6** Bourdon system for pressure measurement. (Final Report No. J-3.1.) Roy E. Hunt and William H. Avery. OEMsr-273; Service Project Nos. OD-14 and NO-33; OSRD No. 5860. George Washington University. December, 1945.
- M7** Development of apparatus for recording pressure versus integral of pressure. K. S. Dunlap. OEMsr-256; Service Project No. OD-26; OSRD No. 6161. Bell Telephone Laboratories, Inc. December 10, 1945.
- M8** The development, annealing and calibrating of copper tarage balls. J. R. Townsend. OEMsr-256; Service Project No. OD-26; OSRD No. 6160. Bell Telephone Laboratories, Inc. January 3, 1946.

612

Partial-Burning and Burning Rates

- M1** A partial-burning powder tester. (Memorandum No. A-43M.) C. N. Hickman. Service Project Nos. OD-14, OD-26 and others; OSRD No. 665. Jet Propulsion Research Laboratory, Indian Head, Md. June 29, 1942.
- M2** Partial-burning equipment. (Report No. CIT/JGC-4.) John McMorris and F. E. Roach. OEMsr-418. California Institute of Technology. November 3, 1942.
- M3** Direct measurement of burning rates by an electric timing method. (Report No. A-286.) Bryce L. Crawford, Jr. and Clayton Huggett. OEMsr-716; Service Project Nos. OD-14 and NO-33; OSRD No. 4009. University of Minnesota. August, 1944.

613

Blast

- M1** Electronic blastmeter. (Report No. J-2.1.) S. Shulman and W. H. Barber. OEMsr-273; Project Nos. NO-33 and J-18; OSRD No. 5847. George Washington University. November, 1945.

614

Yaw

- M1** Further investigations conducted with the yaw

machine. (Local Intermediate Report No. CIT/ILC-2.) (n.a.) California Institute of Technology. January 4, 1943.

- M2** Application of the optical lever principle to following projection tip-off and yaw motions during early burning of rockets. (Final Report No. J-6.) Milton R. Goff. OEMsr-273; Project Nos. J-42, NO-33 and OD-14; OSRD No. 5871. George Washington University. February, 1946.

615 Temperature

- M1** The effective rocket temperature indicator. (Report No. CIT/INC-5.) R. White and J. M. Schmidt. OEMsr-418. California Institute of Technology. December 12, 1944.
- M2** High-speed temperature-time recorders employing an electronic inverter. (Final Report No. J-4.) N. E. Alexander. OEMsr-273; Service Project Nos. NO-33 and OD-14; OSRD No. 5868. George Washington University. November, 1945.

620 Test Instruments and Equipment

621 Gauges

- M1** New gauges for measuring the thrusts of rockets. (Memorandum Nos. A-38M and A-39M.) C. N. Hickman. Service Project No. OD-26; OSRD No. 433. Jet Propulsion Research Laboratory, Indian Head, Md. March 2, 1942.
- M2** Piston thrust gauge. (Final Report No. J-3.2.) Alfred Africano. OEMsr-273; Service Project Nos. OD-14 and NO-33; OSRD No. 5864. George Washington University. January, 1946.
- M3** Copper ball crusher gauges. (Final Report No. J-3.3.) Alfred Africano. OEMsr-273; Service Project Nos. OD-14 and NO-33; OSRD No. 5863. George Washington University. January, 1946.

621.1 Wire Strain Gauges

- M1** The manufacture of wire strain gauges for the measurement of thrust as applied to rocket research. (Report No. J-1.2.) N. E. Alexander. OEMsr-273; Project Nos. NO-33, OD-14 and J-10.3; OSRD No. 5843. George Washington University. November, 1945.
- M2** Audible null indicator for 15,000-cycle/sec alternating current bridge equipment. (Final Report No. J-1.7.) N. E. Alexander. OEMsr-273; Service Project Nos. OD-14 and NO-33; OSRD No. 5870. George Washington University. November, 1945.
- M3** Calibration equipment for pressure and thrust wire strain gauges. (Final Report No. J-1.8.) G. M. Lathrop and N. E. Alexander. OEMsr-273; Project Nos. NO-33, OD-14 and J-15; OSRD No. 5862. George Washington University. November, 1945.
- M4** Alternating current bridge and preamplifier for strain gauge measurement of pressure and thrust. (Final Report No. J-1.3.) N. E. Alexander. OEMsr-273; Service Project Nos. OD-14 and NO-

33; OSRD No. 5857. George Washington University. December, 1945.

- M5** The manufacture of wire strain gauges for the measurement of pressure as applied to rocket research. (Final Report No. J-1.1.) N. E. Alexander. OEMsr-273; Service Project Nos. OD-14 and NO-33; OSRD No. 5856. George Washington University. December, 1945.

622 Amplifier Calibrators

- M1** Standard automatic calibrator for alternating current bridge and amplifiers. (Report No. J-1.4.) N. E. Alexander. OEMsr-273; Project Nos. NO-33, OD-14 and J-10.6; OSRD No. 5846. George Washington University. November, 1945.
- M2** Design and production of amplifier calibrators. J. S. Garvin. OEMsr-256; Project Nos. J-15 and OD-14; OSRD No. 6163. Bell Telephone Laboratories, Inc. December 13, 1945.

623 Decelerometers

- M1** Drop table and decelerometer. Construction, calibration and operation. (Report No. CIT/JGC-7.) F. C. Lindvall. OEMsr-418. California Institute of Technology. November 15, 1943.
- M2** Impact decelerometers. (Report No. CIT/JHC-3.) Bruce H. Rule. OEMsr-418; Service Project Nos. NO-36.5 and NO-146. California Institute of Technology. January 24, 1944.

624 Cameras

624.1 Types

624.11 Ribbon-Frame

- M1** The ribbon-frame camera. (Report No. A-196.) Frank Reck. OEMsr-256; Service Project Nos. OD-26 and NO-33; OSRD No. 1605. Bell Telephone Laboratories, Inc. July, 1943.
- M2** Instructions for use of the ribbon-frame camera. (Report No. A-251.) M. J. Walker. OEMsr-256; Service Project Nos. OD-26 and NO-33; OSRD No. 3280. Bell Telephone Laboratories, Inc. February, 1944.
- M3** Development of ribbon-frame camera. F. L. McNair and Frank Reck. OEMsr-256; Service Project No. OD-26; OSRD No. 6157. Bell Telephone Laboratories, Inc. December 11, 1945.

624.12 Rotating-Mirror

- M1** The California Institute of Technology rotating-mirror camera, Model 2. Project Camel. (Report No. CIT/K-3.1.) Ira S. Bowen. OEMsr-418. California Institute of Technology. April 27, 1945.
- M2** Auxiliary equipment for California Institute of Technology rotating-mirror camera and further notes on the camera. Project Camel. (Report No. CIT/K-3.3.) Ira S. Bowen. OEMsr-418. California Institute of Technology. June 8, 1945.

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624.13 Miscellaneous Types

- M1** The solar yaw camera. (Report No. CIT/JFC-2.) William R. Smythe. OEMsr-418; Service Project Nos. OD-167 and NO-215; OSRD No. 2190. California Institute of Technology. May 8, 1945.
- M2** The California Institute of Technology acceleration camera, Models 3 and 4. (Report No. CIT/JFC-3.) Clyde Chivens. OEMsr-418; OSRD No. 2518. California Institute of Technology. August 25, 1945.
- M3** Two-channel ballistics camera. (Final Report No. J-1.5.) N. E. Alexander. OEMsr-273; Project Nos. OD-14, NO-33 and J-10.5; OSRD No. 5858. George Washington University. December, 1945.

624.2 Photography**624.21 Measurements**

- M1** Photographic measurements of rocket flight. (Report No. CIT/JFC-1.) Donald P. Barrett, Ira S. Bowen and others. OEMsr-250. California Institute of Technology. June 1, 1942.
- M2** Photographic measurement of rocket flight. (Progress Report No. A-62.) Donald P. Barrett, Ira S. Bowen and others. OEMsr-250; Service Project Nos. OD-26, CWS-22 and others. California Institute of Technology. June 9, 1942.

624.22 X-Ray

- M1** X-ray photography of burning rocket propellants. (Report No. J-5.) W. P. Spaulding, Ray S. Craig and Sidney Golden. OEMsr-273; Research Project Nos. W-60.1 and W-80; OSRD No. 5849. George Washington University. December, 1945.

625 Targets

- M1** Rocket targets. (Progress Report No. A-27, as of November 1, 1941.) A. J. Dempster. Service Project No. OD-26; OSRD No. 311. December 24, 1941.
- M2** The trajectories of target rockets. (Progress Report No. A-28.) A. J. Dempster. Service Project No. OD-26; OSRD No. 345. January 27, 1942.
- M3** Rocket targets. (First and Second Interim Report Nos. CIT/JBC-3 and CIT/JBC-4.) William A. Fowler. Research Project No. PDRC-155. California Institute of Technology. January 31 and April 14, 1942.
- M4** The design, development and testing of rocket targets. (Progress Report No. A-34, as of February 1, 1942.) William A. Fowler. Service Project No. OD-26. February 16, 1942.
- M5** Design of rocket targets adopted by the Army Ordnance Department. (Memorandum No. A-46M.) L. A. Skinner. Project Nos. OD-26 and PA-391. Jet Propulsion Research Laboratory, Indian Head, Md. July 13, 1942.
- M6** California Institute of Technology rocket targets. (Report No. CIT/JBC-17.) James B. Edson.

OEMsr-418. California Institute of Technology. June 12, 1943.

- M7** Gunnery and tactical training with rocket targets. (Report No. CIT/JNC-10.) James B. Edson. OEMsr-418. California Institute of Technology. December 14, 1943.
- M8** Manual of manufacturing and inspection problems of the rocket target, Mark 3. (Report No. CIT/JSC-3.) (n.a.) OEMsr-418; Service Project No. NO-170. California Institute of Technology. March 1, 1944.
- M9** Rocket targets developed for the Army Ordnance Department. (Final Report No. W-2.) C. N. Hickman. OEMsr-273; Project Nos. OD-26, PA-391 and W-20; OSRD No. 5775. George Washington University. December, 1945.

625.1 Components

- M1** A projector for rocket targets. (Progress Report No. A-47, as of February 24, 1942.) William R. Smythe. Service Project Nos. OD-26 and CWS-22. April 6, 1942.
- M2** Target launchers. (Report No. CIT/JNC-10App. Appendix No. 2.) (n.a.) California Institute of Technology. (n.d.)

625.2 Scoring Systems

- M1** Scoring registers for target practice with automatic weapons. (Report No. CIT/JNC-1.) James B. Edson. OEMsr-495. California Institute of Technology. February 20, 1942.
- M2** Scoring register and recorder for target practice. (Report No. CIT/JNC-2.) James B. Edson. OEMsr-250. California Institute of Technology. May 1, 1942.
- M3** Feasibility of visual coincidence scoring by two observers of tracer bullets shot at rocket targets. (Report No. CIT/JNC-3.) Jesse W. M. DuMond. OEMsr-250. California Institute of Technology. May 1, 1942.
- M4** Use of the 7-dial scoring register and tape recorder for rocket target practice. (Report No. CIT/JNC-6.) James B. Edson. OEMsr-418. California Institute of Technology. August 11, 1943.

626 Static Firing Test Equipment

- M1** Equipment and procedure for static firing tests. (Interim Report No. CIT/JGC-2.) Donald S. Clark. OEMsr-250. California Institute of Technology. March 21, 1942.
- M2** Equipment and procedure for static firing tests. (Progress Report No. A-61.) Donald S. Clark. OEMsr-250; Service Project No. OD-26. California Institute of Technology. June 2, 1942.
- M3** Equipment for static firing tests. (Report No. CIT/JGC-3.) E. L. Ellis and N. R. Gunderson. OEMsr-418. California Institute of Technology. November 12, 1942.
- M4** Evaluation of pressure-time relationships occurring in static firing of rocket motors. (Report No.

CIT/JGC-8.) Bruce H. Sage. OEMsr-418; OSRD No. 2484. California Institute of Technology. April 10, 1945.

M5 Standard frequency oscillators, tuning-fork type. (Final Report No. J-1.6.) N. E. Alexander. OEMsr-273; Service Project Nos. OD-14 and NO-33; OSRD No. 5869. George Washington University. November, 1945.

M6 Static range operational and fire control equipment for rocket research. (Final Report No. J-1.) C. M. Lathrop and N. E. Alexander. OEMsr-273; Service Project Nos. OD-14 and NO-33; OSRD No. 5855. George Washington University. June, 1946.

627 Sound Range Recorder

M1 Recorder settings and range errors for attacks with ahead-thrown weapons on deep targets. (Parts I and II. Report No. CIT/JPC-14.) M. A. Biot. OEMsr-418. California Institute of Technology. September 1, 1943.

700 UNDERWATER BALLISTICS

M1 Underwater ballistics. (Part 6. Bi-Weekly Progress Report Nos. CIT/PMC-2.84, -2.85 and -2.87 [for] two week period ending June 24, July 8 and August 5, 1945.) Max Mason and L. B. Slichter. OEMsr-418; OSRD Nos. 2482, 2491 and 2509. California Institute of Technology.

710 Characteristics of Underwater Ballistics

711 Trajectory

M1 Radius of curvature of the underwater trajectory of a rocket. (Local Intermediate Report No. CIT/IPC-54.) Leverett Davis, Jr. California Institute of Technology. March 17, 1944.

M2 Underwater trajectories of the 3.5" aircraft rocket, Model 5. (Report No. CIT/JPC-21.) R. V. Adams. OEMsr-418; Service Project Nos. OD-162 and NO-170; OSRD No. 2161. California Institute of Technology. June 10, 1944.

M3 Underwater trajectory tests of production units of British projectile, Type C. (Report No. CIT/IOC-28.4.) Max Mason and L. B. Slichter. OEMsr-418; Service Project No. NO-146; OSRD No. 2339. California Institute of Technology. January 2, 1945.

M4 Underwater performance of British projectile, Type C. (Report No. CIT/IOC-28.5.) Max Mason and L. B. Slichter. OEMsr-418; Service Project No. NO-146; OSRD No. 2475. California Institute of Technology. May 10, 1945.

712 Drag

M1 Antisubmarine (AS) projector charges. Terminal Velocity summary. (Report No. CIT/IPC-38.) Bruce H. Rule and W. P. Huntley. California Institute of Technology. August 18, 1943.

M2 Estimation of drag and nose-lift coefficients of

some rockets necessary to give a prescribed underwater behavior. (Local Intermediate Report No. CIT/IPC-57.) Leverett Davis, Jr. and L. Ivan Epstein. California Institute of Technology. April 10, 1944.

713

Water Entry

M1 The mechanism of water entry of projectiles. (Report No. CIT/JPC-13.) M. A. Biot. OEMsr-418. California Institute of Technology. September 1, 1943.

M2 3.5" AR bodies with non-ricochet properties at low angles of water impact. (Local Intermediate Report No. CIT/IPC-64.) Ira S. Bowen. California Institute of Technology. October 10, 1944.

M3 The effect of roughness of the sea on the entry and ricochet angles of a projectile. (Report No. CIT/IOC-31.) Max Mason and L. B. Slichter. OEMsr-418; Service Project No. NO-176; OSRD No. 2374. California Institute of Technology. February 1, 1945.

M4 Structural damage associated with water entry of projectiles. (Report No. CIT/JOC-3.) D. E. Hudson. OEMsr-418; Service Project No. NO-176; OSRD No. 2381. California Institute of Technology. February 15, 1945.

M5 Water entry and underwater ballistics of projectiles. Edited by: Alice C. Ritter. OEMsr-418; OSRD No. 2551. California Institute of Technology. 1946.

714

Tail Spin

M1 Effect of tail spin on underwater projectiles. (Report No. CIT/IPC-9.) Bruce H. Rule. OEMsr-329. California Institute of Technology. August 5, 1942.

720

Types of Underwater Projectiles (See also: 731)

721

Rockets

M1 Underwater tests of 2½" antisubmarine rocket subcaliber with magnesium flare head. (Report No. CIT/IPC-37.) Bruce H. Rule and W. P. Huntley. California Institute of Technology. August 3, 1943.

M2 Underwater behavior of 3.5-inch aircraft rockets. (Report No. CIT/JBC-23.) Ira S. Bowen. OEMsr-418. California Institute of Technology. December 6, 1943.

M3 Further investigations of the underwater behavior of aircraft rockets. (Report No. CIT/JBC-27.) Ira S. Bowen, R. V. Adams and Sylvan Rubin. OEMsr-418; OSRD No. 2152. California Institute of Technology. June 26, 1944.

M4 VAR subcaliber underwater performance tests. (Report No. CIT/IPC-27.) Bruce H. Rule and W. P. Huntley. California Institute of Technology. (n.d.)

- 722 Torpedoes**
- M1** Torpedo. Deceleration, model tests and torpedo range work. (Part 5. Weekly and Bi-Weekly Progress Report Nos. CIT/PMC-2.27, -2.38, -2.48, -2.62, -2.69, -2.84, -2.85 and -2.87 [for the] period ending April 9, June 25, September 3, December 10, 1944; January 28, June 24, July 8 and August 5, 1945.) F. C. Lindvall. OEMsr-418; OSRD Nos. 2131, 2203, 2310, 2363, 2481, 2490 and 2508. California Institute of Technology.
- 722.1 Deceleration**
- M1** Torpedo deceleration. (Report No. CIT/JBC-28.) William R. Smythe. OEMsr-418; Service Project No. NO-168; OSRD No. 2160. California Institute of Technology. June 29, 1944.
- 722.2 Water Entry**
- M1** Instruments developed for an experimental study of the water entry of torpedoes and full-scale torpedo models. (Report No. CIT/JHC-6.) F. C. Lindvall. OEMsr-418; Service Project No. NO-176; OSRD No. 2431. California Institute of Technology. April 10, 1945.
- M2** Photographic studies in underwater ballistics. (Report No. CIT/IPC-81.) P. M. Hurley, J. S. Fassero and R. C. Jackson. OEMsr-418. California Institute of Technology. November 15, 1945.
- 722.3 Jet-Propulsion Unit**
- M1** Development of a jet-propulsion unit for the Mark 13 torpedo. (Report No. CIT/JOC-4.) Bruce H. Sage. OEMsr-418; Service Project No. NO-177; OSRD No. 2539. California Institute of Technology. September 12, 1945.
- 722.4 Launching**
- M1** California Institute of Technology torpedo launching range, Morris Dam Reservoir. General description of facilities. (Report No. CIT/JHC-2.) F. C. Lindvall. OEMsr-418. California Institute of Technology. October 15, 1943.
- M2** Torpedo launching tests at California Institute of Technology Torpedo Launching Range, through April 1, 1944. (Report No. CIT/JOC-2.) F. C. Lindvall. OEMsr-418; Service Project Nos. NO-148 and NO-177; OSRD No. 2105. California Institute of Technology. May 17, 1944.
- M3** Torpedo launching project report. (Report No. CIT/JHC-5, for year ending November 30, 1944.) F. C. Lindvall. OEMsr-418; Service Project No. NO-176; OSRD No. 2346. California Institute of Technology. February 1, 1945.
- M4** Development of a photoflare for torpedo launching investigations. (Report No. Ms-828/JHC-8.) Bruce H. Sage. OEMsr-418. California Institute of Technology. December 1, 1945.
- 723 Miscellaneous Projectiles**
- M1** Performance characteristics of 2½-inch diameter underwater integral motor target bomb. (Report No. CIT/IPC-6.) Bruce H. Rule. California Institute of Technology. May 29, 1942.
- M2** Special underwater tests [at] Morris Dam on fuzes and projectiles. (Weekly Progress Report No. CIT/PMC-2.38 [for the] period ending June 25, 1944.) Bruce H. Rule. OEMsr-418; OSRD No. 2132. California Institute of Technology. June, 1944.
- 730 Antisubmarine Warfare**
- M1** Antisubmarine warfare. (Weekly Progress Report No. CIT/PMC-2.38 [for the] period ending June 25, 1944.) L. B. Slichter. OEMsr-418; OSRD No. 2133. California Institute of Technology. June, 1944.
- 731 Projectile Types**
(See also: 720)
- 731.1 Mousetrap**
- M1** Underwater characteristics of 7.2-inch diameter mousetrap projectile and 7-inch diameter integral motor modification tests, March 31 to May 15, 1942. (Report No. CIT/IPC-5.) Bruce H. Rule. California Institute of Technology. [May, 1942.]
- M2** Performance comparisons for 7.2-inch diameter modified mousetrap projectile, May 28 to June 20, 1942. (Report No. CIT/IPC-7.) Bruce H. Rule. OEMsr-329. California Institute of Technology. [June, 1942.]
- M3** The antisubmarine bomb (ASB). (Part I. Report No. CIT/JBC-7.) W. N. Arnquist, Leverett Davis, Jr. and others. OEMsr-418. California Institute of Technology. June 25, 1942.
- M4** Entry and underwater characteristics of 7.2-inch diameter, flat-nosed mousetrap and hedgehog projectiles. (Report No. CIT/IBC-8.) Bruce H. Rule. OEMsr-329. California Institute of Technology. July 13, 1942.
- M5** The antisubmarine bomb. (Part I. Progress Report No. A-74.) Leverett Davis, Jr., Thomas L. Lauritsen and others. OEMsr-418; Project Nos. OD-26, NO-36.5 and PA-365. California Institute of Technology. July 27, 1942.
- M6** The antisubmarine bomb. Part II, The propellant. (Progress Report No. A-77.) W. N. Arnquist, Leverett Davis, Jr. and others. OEMsr-418; Project Nos. OD-14, PA-310 and others. California Institute of Technology. August 12, 1942.
- M7** Progress on the installation and training program for the antisubmarine bomb, or mousetrap. (Memorandum No. A-51M, as of August 15, 1942.) William R. Smythe. OEMsr-418; Project Nos. OD-26, NO-36.5 and PA-365; OSRD No. 805. California Institute of Technology. August 19, 1942.
- M8** Mousetrap. Operating instructions. (Report No.

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CIT/JBC-13.) L. B. Slichter and Thomas L. Lauritsen. OEMsr-418. California Institute of Technology. October 25, 1942.

- M9** Water entry and underwater trajectory tests on Bureau of Ordnance antisubmarine bomb, mousetrap. (Report No. CIT/IPC-14.) Bruce H. Rule. California Institute of Technology. December 3, 1942.
- M10** Underwater tests of mousetrap with line and drogue. (Report No. CIT/IOC-17.) Bruce H. Rule and W. P. Huntley. California Institute of Technology. August 12, 1943.
- M11** Underwater performance tests of 7.2" rocket, Mark 3 mousetrap assembly with Mark 131 fuze and with Mark 140 fuze and protective cap. (Report No. CIT/IBC-60.) R. L. Noland. OEMsr-418. California Institute of Technology. February 4, 1944.
- M12** The ballistics of firing an antisubmarine bomb backwards from an airplane. (Research Memorandum No. CIT/ITC-4.) Leverett Davis, Jr. California Institute of Technology. (n.d.)
- M13** Impact and deceleration of the antisubmarine bomb, mousetrap. (Report No. CIT/IPC-12.) Bruce H. Rule and W. P. Huntley. California Institute of Technology. (n.d.)

731.2 Hedgehog

- M1** Bureau of Ordnance subcaliber ammunition for antisubmarine projector, Mark 10, hedgehog. Underwater performance tests. (Report No. CIT/IOC-11.) Bruce H. Rule and W. P. Huntley. California Institute of Technology. September 21, 1943.
- M2** Underwater performance tests of Bureau of Ordnance, Mark 6 and Bureau of Ordnance, Mark 8 projector charges, hedgehog, with Mark 140 fuze and protective cap. (Report No. CIT/IOC-23.) R. L. Noland. OEMsr-418. California Institute of Technology. February 28, 1944.
- M3** Antisubmarine projector charge (ASPC) subcaliber underwater performance tests. (Report No. CIT/IPC-32.) Bruce H. Rule and W. P. Huntley. California Institute of Technology. (n.d.)

731.21 Mark 1

- M1** Impact and deceleration of the antisubmarine projector charge (ASPC) Mark 1 projectile and modified antisubmarine bomb. (Report No. CIT/JBC-15.) Bruce H. Rule and W. P. Huntley. OEMsr-418. California Institute of Technology. February 10, 1943.
- M2** Slat deck impact deceleration tests, antisubmarine projector charge (ASPC) Mark 1. (Report No. CIT/IOC-5. Addendum I.) Bruce H. Rule and W. P. Huntley. California Institute of Technology. July 12, 1943.

731.22 Mark 11

- M1** Underwater performance tests of Bureau of Ord-

nance antisubmarine projector charge (ASPC) Mark 11. (Report No. CIT/IPC-33.) Bruce H. Rule and W. P. Huntley. California Institute of Technology. August 10, 1943.

731.3 Depth Charges

- M1** Underwater tests of depth charges and depth charge pistols. (Report No. CIT/JOC-1.) Bruce H. Rule. OEMsr-418. California Institute of Technology. June 18, 1943.
- M2** Underwater performance of 7.2" diameter fast-sinking depth charge with Mark 140 fuze, with and without protective cap. (Report No. CIT/IOC-26.) Bruce H. Rule and W. P. Huntley. OEMsr-418. California Institute of Technology. May 13, 1944.
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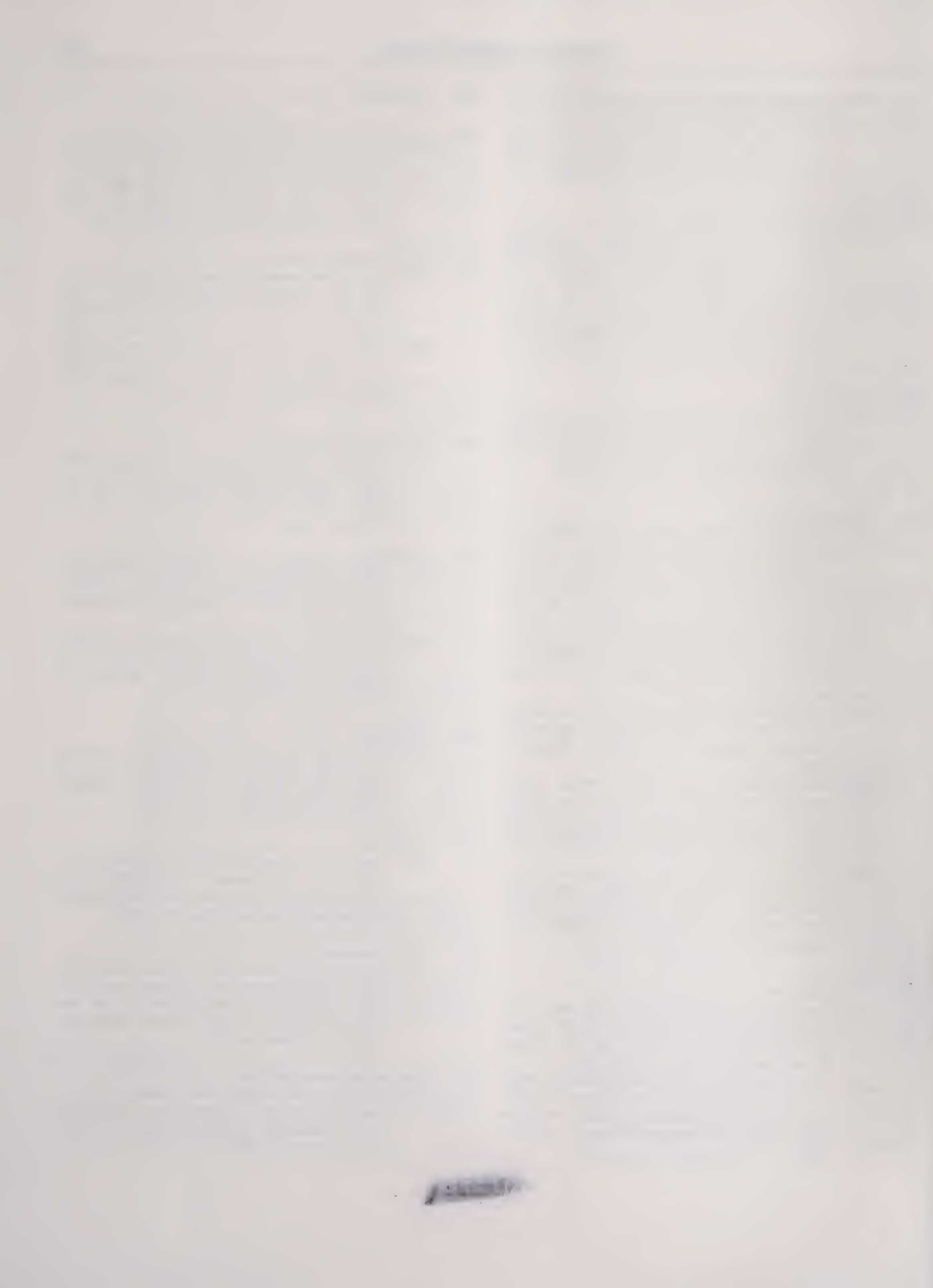
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- 821 Portable**
- M1** Development of portable cordite-operated gas generator for pressurizing M2-A2 flame throwers. A. S. Collins and A. A. Nellis. Massachusetts Institute of Technology and George Washington University. July 12, 1945.
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- M2** Weekly progress reports [on] Contract OEMsr-2163. (Interim Report Nos. 31 to 41, 44 to 50, 52 to 61, 63, 65, 66 and 68 to 71 [for the period from] October [2] 1943 [to] September 30, 1944.) Dorman D. Israel, A. G. Rogers and others. OEMsr-2163; Project No. P4-771R. Emerson Radio and Phonograph Corporation.
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- M4** Summary of activities in development and pilot manufacturing run of radio fuzes and accessories. Vernon D. Hauck. OEMsr-258. Bendix Aviation Corporation. September 27, 1944.
- M5** Final technical report of . . . Contract OEMsr-954. (n.a.) OEMsr-954. Zell Corporation. January 12, 1945.
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- M7** Summary technical report for Contract OEMsr-769. (n.a.) OEMsr-769. State University of Iowa. September 29, 1945.
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- M2** Basic theory of the radio proximity fuze. [Philip R. Karr.] NBS, Ordnance Development Division. May 25, 1945.

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- M2** Radio proximity fuzes for bombs and rockets, as of May 28, 1942. (Progress Report No. A-64.) Harry M. Diamond. Service Project Nos. OD-27, OD-33 and CWS-19. NBS, Ordnance Development Division. June 15, 1942.
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- M4** Research and development . . . on P4-772 radio proximity fuze for large bombs. (Final report.) R. A. Bell. OEMsr-866. Philco Radio and Television Corporation. June 15, 1943.
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- 221 **Combat Areas**
M1 Resumé of AIBR Project in the European Theatre of Operations, covering period July 1, 1944 to June 6, 1945. (Report No. OD-SP-126.) William L. Whitson. NBS, Ordnance Development Division. July 12, 1945.
M2 Operational uses of bomb and rocket VT fuzes by US Army and Navy in World War II. (Report No. OD-Army-4.) Walter G. Finch. October 15, 1945.
- 222 **Field Tests**
- 222.1 **Radio Proximity Fuzes**
- 222.11 **Bomb Fuzes**
M1 Summaries of field test results of experimental bomb fuzes. (Report No. OD-2-224 covering the period from October 31, 1944 to September 17, 1945.) (n.a.) NBS, Ordnance Development Division.
- 222.111 **T-50**
M1 Field test of twenty-seven Philco T-50 E-1 with metal propellers (PX-5) at Aberdeen, July 12, 1944. (Report No. OD-1-405.) D. C. Friedman. NBS, Ordnance Development Division. July 17, 1944.
M2 Field test of forty Bowen T-50 E-10 units, ten set to function on arming, Lot 141 at Aberdeen, December 6, 1944. (Report No. OD-1-585.) R. Vorkink. NBS, Ordnance Development Division. December 14, 1944.
- 222.112 **T-51**
M1 Field test of twenty-one Zenith T-51 units, Lot 53, with 9-inch balanced bakelite vanes at Aberdeen, January 12, 1945. (Report No. OD-1-626.) G. Rabinow. NBS, Ordnance Development Division. January 19, 1945.
M2 High-altitude test of twenty-four Zenith T-51 units, Lots ZX-1 and ZX-2, ball bearings in nose or generator at Aberdeen, March 16 and 17, 1945. (Report No. OD-1-684.) G. Rabinow. NBS, Ordnance Development Division. March 24, 1945.
M3 High-altitude test of twelve Zenith T-51 units, Lot ZX-3, ball bearings in nose and generator at Aberdeen, March 28 and April 9, 1945. (Report No. OD-1-701.) G. Rabinow. NBS, Ordnance Development Division. April 12, 1945.
M4 Field test of twenty-one Zenith T-51 units, Lot ZX-9, Wurlitzer power supply at Aberdeen, May 7 and 9, 1945. (Report No. OD-1-749.) R. Vorkink. NBS, Ordnance Development Division. May 18, 1945.
M5 Mass production of T-51 fuzes by the Zenith Radio Corporation. Earl J. Diehl. OEMsr-1477; Service Project No. OD-27. Zenith Radio Corporation. October 30, 1945.
- 222.113 **T-82**
M1 Arming test of eighteen Westinghouse T-82 units, Lot 25, on M-81, M-64 and M-65 at Aberdeen, April 12, 13 and 17, 1945. (Report No. OD-1-715.) G. Rabinow. NBS, Ordnance Development Division. April 19, 1945.
M2 Proximity fuze, bomb, nose, ground approach, Type VT, T-82. (Termination Report No. CFE-759.) T. M. Bloomer. OEMsr-343 and OEMsr-1106. Westinghouse Electric and Manufacturing Company, Inc. April 28, 1945.
M3 Field test of twenty Westinghouse T-82, Lot 25, on M-30, M-64, M-65 and M-66 at Aberdeen, April 14, 18 and 27, 1945. (Report No. OD-1-733.) R. Vorkink. NBS, Ordnance Development Division. May 8, 1945.
M4 Field test of twenty Westinghouse T-82 units, Lot 2 at Aberdeen, April 27 and May 2, 1945. (Report No. OD-1-736.) R. Vorkink. NBS, Ordnance Development Division. May 8, 1945.
M5 Reporter test of ten Westinghouse T-82 E-1 units, Lot EWEM-3-1 at Aberdeen, August 18, 1945. (Report No. OD-1-879.) G. Rabinow. NBS, Ordnance Development Division. August 28, 1945.
- 222.114 **T-91 and T-92**
M1 Field test of eighteen Emerson T-92 units, Lot

CEX-129 [at] Aberdeen, May 9 and 11, 1945. (Report No. OD-1-755.) R. Vorkink. NBS, Ordnance Development Division. May 21, 1945.

- M2** Field test [of] one hundred forty Philco T-91, Lot PA-307-1 and 120 Emerson T-92, Lot PA-306-2 [at] Aberdeen, April 21 to May 21, 1945. (Report No. OD-1-825.) R. Vorkink. NBS, Ordnance Development Division. July 9, 1945.

222.115 Miscellaneous Bomb Fuze Tests

- M1** [Results of the gas distribution trials with T-51 and T-82.] Allen V. Astin. March 7, 1945.

222.12 Rocket Fuzes

- M1** Rocket fuze test results at Blossom Point and Dahlgren. (Memorandum No. OD-7-97M.) Paul F. Bartunek and C. F. Smolen. [NBS, Ordnance Development Division.] April 2, 1945.
- M2** Summary of recent target tests at Blossom Point. (Report No. OD-7-98.) Alexander Orden and C. F. Smolen. [NBS, Ordnance Development Division.] April 9, 1945.

222.121 T-5

- M1** Field test of T-5 on projectiles with bubble-wire traps [at] Blossom Point, April 28, 1944. (Report No. OD-1-368.) D. W. Scott. NBS, Ordnance Development Division. June 19, 1944.
- M2** Field test of T-5 projectiles with salted powder and bubble-wire traps [at] Blossom Point, June 7, 15, 22 and 27, 1944. (Report No. OD-1-397.) D. W. Scott. NBS, Ordnance Development Division. July 10, 1944.
- M3** Field test of T-5 on projectiles with crimped and brazed fins [at] Blossom Point, July 6, 1944. (Report No. OD-1-403.) D. W. Scott. NBS, Ordnance Development Division. July 17, 1944.
- M4** [Test of the] effect of bayonet and bag igniters on functioning of T-5 fuze [at] Blossom Point, July 11, 1944. (Report No. OD-1-408.) D. W. Scott. NBS, Ordnance Development Division. July 19, 1944.
- M5** [Test of] fifty T-5 on M-9A1 with clamp-on fixed fins [at] Blossom Point, August 10 and 24, 1944. (Report No. OD-1-486.) D. W. Scott. NBS, Ordnance Development Division. September 5, 1944.
- M6** Early functioning of T-5 units. Tests of powder lots, motor lots, igniters [and] traps [at] Blossom Point, February 15 and 23, March 2, 9, 21 and 30, 1944. (Report No. OD-1-227.) D. W. Scott and T. N. White. NBS, Ordnance Development Division. Revised: September 22, 1944.
- M7** Static tests to determine the effect of different trap and motor combinations on the functioning of the T-5 fuze. (Report No. OD-1-589.) Charles C. Gordon. NBS, Ordnance Development Division. December 15, 1944.
- M8** Flight test [of] T-5 fuzes on T-22 rockets with EJA propellant [at] Blossom Point, November 24 and December 1, 1944. (Report No. OD-1-614.)

D. W. Scott. NBS, Ordnance Development Division. January 4, 1945.

- M9** Field test [of the] effect of rocket spin on T-5 performance [at] Blossom Point, March 2, 6 and 7, 1945. (Report No. OD-1-677.) D. W. Scott. NBS, Ordnance Development Division. March 21, 1945.
- M10** Field test [of] effect of rocket spin on T-5 arming distance [at] Blossom Point, March 13, 1945. (Report No. OD-1-678.) D. W. Scott. NBS, Ordnance Development Division. March 21, 1945.
- M11** Field test [of] arming time of T-5 on T-22 fired from spiral launcher [at] Blossom Point, March 15, 1945. (Report No. OD-1-689.) D. W. Scott. NBS, Ordnance Development Division. March 28, 1945.
- M12** Field test [of] the effect of trap length on incidence of early functions [at] Blossom Point, March 7 and 17, 1945. (Report No. OD-1-691.) D. W. Scott. NBS, Ordnance Development Division. March 29, 1945.

222.122 T-6

- M1** Field test of modified fins [at] Blossom Point, April 18, 1944. (Report No. OD-1-259.) D. W. Scott. NBS, Ordnance Development Division. April 25, 1944.
- M2** Field test of fifty T-6 units on rigid-fin projectiles [at] Blossom Point, April 28, 1944. (Report No. OD-1-280.) D. W. Scott. NBS, Ordnance Development Division. May 15, 1944.
- M3** Mid-functioning. H. F. Stimson. [NBS, Ordnance Development Division.] June 5, 1944.

222.123 T-5 and T-6 Combined Lots

- M1** [Test of] eleven T-5 and eleven T-6 units on Revere Phase II motors with spring-operated fins [at] Blossom Point, February 18 and 24, 1944. (Report No. OD-1-171.) D. C. Friedman. NBS, Ordnance Development Division. February 26, 1944.
- M2** Field test of T-5 and T-6 on projectiles with loose joints [at] Blossom Point, June 7 and 12, 1944. (Report No. OD-1-395.) D. W. Scott. NBS, Ordnance Development Division. July 8, 1944.
- M3** Effect of rocket spin upon the performance of VT fuzes, T-4, T-5 [and] T-6. (Report No. OD-1-668.) Theodore B. Godfrey. NBS, Ordnance Development Division. March 13, 1945.
- M4** Effect of rain upon the performance of VT fuzes, T-5 and T-6. (Summary Report No. OD-1-669.) Theodore B. Godfrey. NBS, Ordnance Development Division. March 13, 1945.

222.124 T-30

- M1** Plane firing of T-30 on Mark 7 [at] Dahlgren, January 24, 1945. (Report No. OD-1-650.) D. W. Scott. NBS, Ordnance Development Division. February 7, 1945.
- M2** Lot quality test of twelve Philco AN/CPQ-3, T-30 units, Lot PX-29 [at] Blossom Point, February 27, 1945. (Report No. OD-1-664.) G. Rabinow. NBS,

- Ordnance Development Division. March 2, 1945.
- M3** Tests BJM-5 and BJM-6. (Progress Report No. OD-7-206R.) Charles Ravitsky. NBS, Ordnance Development Division. May 14, 1945.
- 222.125 T-2004 and T-2005**
- M1** Plane firing test [of] Philco T-2004 on T-87 [at] Aberdeen, April 30, 1945. (Report No. OD-1-744.) D. W. Scott. NBS, Ordnance Development Division. May 10, 1945.
- M2** Generator-powered radio proximity fuze, Type T-2005. Muriel E. Pottasch. OEMsr-1437. General Instrument Corporation. August 1, 1945.
- 222.126 T-30 and T-2004 Combined Lots**
- M1** Summary of tests of T-30 and T-2004 (T-30 adapted for plane-to-ground application) rocket fuzes during the period November 30, 1944 to March 31, 1945 inclusive. (Report No. OD-7-108.) Paul F. Bartunek. NBS, Ordnance Development Division. April 30, 1945.
- M2** Technical specification for parts assemblies for VT reaction grid detection fuzes, T-30 and T-2004. (Draft No. 2.) (n.a.) NBS, Ordnance Development Division. July 20, 1945.
- M3** Summary of field test results [of] rocket fuze plane firing experimental tests, air-to-ground. (Report No. OD-2-269.) (n.a.) NBS, Ordnance Development Division. August 24, 1945.
- M4** Analysis of T-30 and T-2004 function on mechanical arming tests. (Memorandum No. OD-2-272M.) F. L. Celauro. [NBS, Ordnance Development Division.] September 19, 1945.
- 222.127 T-50**
- M1** [Tests of] forty Bowen T-50 E-10 on refrigerated Mark 7 [at] Aberdeen, October 5, 1944. (Report No. OD-1-529.) D. W. Scott. NBS, Ordnance Development Division. October 20, 1944.
- M2** Field test [of] Philco T-50 E-1 reporters with "doughnut" arming rings [at] Blossom Point, January 27 and February 7, 1945. (Report No. OD-1-660.) D. W. Scott. NBS, Ordnance Development Division. February 22, 1945.
- 222.128 MC-382**
- M1** Specifications for the manufacture and testing of the M-3 (MC-382) radio fuze. [Cledo Brunetti.] NBS, Ordnance Development Division. August 31 and September 30, 1942.
- M2** Tuning and adjustment of MC-382. W. S. Hinman, Jr. [NBS, Ordnance Development Division.] November 16, 1942.
- M3** Engineering report on MC-382 test equipment. (n.a.) November 26, 1942.
- M4** [Test of] RRP fuze, MC-382-Emerson. Early functions: the effect of powder load on after-burning and slivers [at] Corncake, March 12, 1943. (Report No. OD-1-AB3.) L. C. Miller. NBS, Ordnance Development Division. March 20, 1943.
- M5** [Tests of] RRP fuze, MC-382-Emerson. Effect of fin structure on early functioning [at] Corncake, March 8, 1943. (Report No. OD-1-AB4.) L. C. Miller. NBS, Ordnance Development Division. March 23, 1943.
- M6** Early function tests [on] RRP fuze, MC-382-Philco [at] Blossom Point, March 19, 1943. [Part] I, Fuzes with reduced sensitivity. [Part] II, Motors with metal sweeps. (Final Report No. OD-1-AB5.) L. C. Miller. NBS, Ordnance Development Division. March 23, 1943.
- M7** Early functions with MC-382 fuze. Further testing with sweeps and with powders [at] Blossom Point, March 23, 1943. (Final Report No. OD-1-AB6.) T. N. White. NBS, Ordnance Development Division. March 27, 1943.
- M8** High-angle firing with MC-382 fuzes [at] Corncake, March 31, April 1, 3, 4 [and] 6, 1943. [Part] A, Early function tests [to determine the effect of] detuning of units [and of] use of sweeps and plugs. [Part] B, Tests of mechanical self-destruction switches. (Final Report No. OD-1-AB11.) L. C. Miller. NBS, Ordnance Development Division. April 17, 1943.
- M9** Tests of sweeps and plugs [at] Corncake, April 21, 1943. (Report No. OD-1-AB13.) R. Vorkink. NBS, Ordnance Development Division. May 7, 1943.
- M10** A comparison of several makes of MC-382 fuze with respect to early, target and late functions and duds occurring in qualification and production lot acceptance tests at Corncake and Blossom Point. (Memorandum Report Nos. 220-T and 282-T.) T. N. White. Service Project No. OD-27. NBS, Ordnance Development Division. May 13 and June 10, 1943.
- M11** [Tests of] fuze, RRP-M3, MC-382-Philco with eccentric and non-eccentric powder, high-angle firing [at] Corncake [on] June 15, 16 and 19, 1943. (Memorandum Report No. 338-T.) R. Vorkink. Service Project No. OD-27. NBS, Ordnance Development Division. [June, 1943.]
- M12** Early functions of MC-382 radio-operated plane-to-plane rocket fuze. (Progress Report No. OD-AB2.) Bertrand J. Miller and Robert D. Huntoon. NBS, Ordnance Development Division. June 8, 1943.
- M13** [Tests of] fuze, rocket, PD, T-6, MC-382 with 5- to 8-second arming time [for] range, dispersion and water approach function [at] Corncake, July 19 and 20, 1943. (Memorandum Report No. 388-T.) D. C. Friedman. Service Project No. OD-27. NBS, Ordnance Development Division. July 28, 1943.
- M14** [Test of] fuze, RRP-M3, MC-382-Philco, for ride-through with various powders and firing angles [at] Corncake, July 15, 1943. (Memorandum Report No. 383-T.) R. Vorkink. Service Project No. OD-27. NBS, Ordnance Development Division. August 5, 1943.
- M15** Test of effect of velocity on early functioning [using] seventy-five fuzes, RRP-M3, MC-382-

- Emerson and Philco [on] July 27, 1943. (Memorandum Report No. 405-T.) R. Vorkink. Service Project No. OD-27. NBS, Ordnance Development Division. August 12, 1943.
- M16** Test for early functioning with different powder weights [of] fifty-eight fuzes, RRP-M3, MC-382D-Philco [at] Blossom Point [on] August 20, 1943. (Report No. OD-1-AB16.) R. Vorkink. NBS, Ordnance Development Division. August 26, 1943.
- M17** Test for malfunctions with special fin motors [having] no locking burr [of] forty-seven MC-382-Philco fuzes [at] Corncake, August 26 [and] 27, 1943. (Report No. OD-1-1.) R. Vorkink. NBS, Ordnance Development Division. September 2, 1943.
- M18** Resistance-capacitance delay added to SW-200 arming switches. Effect on early functioning of MC-382 fuzes [tested at] Blossom Point, May 18 through 22, 1943. (Report No. OD-1-AB15.) T. N. White. NBS, Ordnance Development Division. September 14, 1943.
- M19** Tests on early functioning of MC-382 fuzes [at] Corncake, September 5, 1943. [Part] A, Use of purge pellets. [Part] B, Increased surface area of propellant. (Report No. OD-1-5.) L. C. Miller. NBS, Ordnance Development Division. September 14, 1943.
- M20** Test of propellant charge on early functioning [using] seventy-two Philco MC-382 fuzes fired on Budd and Revere motors [at] Corncake, September 5 and 8, 1943. (Report No. OD-1-13.) R. Vorkink. NBS, Ordnance Development Division. September 20, 1943.
- M21** [Test of] effect of propellant on early functioning [using] two hundred seventeen MC-382 fuzes [at] Corncake, August 23 [and] 24, 1943. [Part] A, Amount of regular propellant. [Part] B, Special propellant. [Part] C, Purge pellets. (Report No. OD-1-8.) T. N. White. NBS, Ordnance Development Division. September 21, 1943.
- M22** Test of effect of purge pellets on early functioning [using] one hundred sixty-four MC-382 fuzes [at] Corncake, September 14, 1943. (Report No. OD-1-17.) R. Vorkink. NBS, Ordnance Development Division. September 30, 1943.
- M23** Early functioning of M-3 fuzes. Purge pellet field test No. 5 [at] Corncake, September 25 and 26, 1943. (Report No. OD-1-22.) L. C. Miller. NBS, Ordnance Development Division. October 6, 1943.
- M24** Early functioning of MC-382 fuzes. Purge pellet field tests No. 6 and No. 7 [at] Corncake, October 1 and 3, 1943. (Report No. OD-1-24.) L. C. Miller. NBS, Ordnance Development Division. October 13, 1943.
- M25** [Tests of] MC-382 fuze performance as affected by motors with non-locking type fins, October 5 and 12, 1943. (Report No. OD-1-27.) T. N. White, L. C. Miller and R. Vorkink. NBS, Ordnance Development Division. October 15, 1943.
- M26** [Tests of] MC-382 fuze performance as affected by motors with fins welded into the opened position, October 29 and 30, 1943. (Report No. OD-1-40.) D. C. Friedman. NBS, Ordnance Development Division. November 4, 1943.
- M27** Early functioning of MC-382 fuzes. Purge pellet field test No. 8 [at] Corncake, October 20 and 21, 1943. Also, tests with power oscillating detector type fuzes and with pressure-control valves. (Report No. OD-1-42.) T. N. White and R. Vorkink. NBS, Ordnance Development Division. November 19, 1943.
- M28** Purge pellet test No. 9 [at] Corncake, November 12, 1943, including tests of combination of motors and propellants, a new salted powder, and pressure control valves. (Report No. OD-1-59.) R. Vorkink. NBS, Ordnance Development Division. November 23, 1943.
- M29** [Test of] one hundred twenty-nine MC-382 units fired at high angle [at] Blossom Point, December 27, 1943 to January 7, 1944. (Report No. OD-1-119.) D. C. Friedman. NBS, Ordnance Development Division. January 26, 1944.
- M30** Field test of eight lots of pellets [at] Blossom Point, January 7, 11 and 12, 1944. (Report No. OD-1-125.) R. Vorkink. NBS, Ordnance Development Division. January 29, 1944.
- M31** Field test [of] forty-nine Philco MC-382 Type S units [and of] forty-nine Friez and Philco standard MC-382 units (controls) [at] Blossom Point, February 23, 25 and March 8, 1944. (Report No. OD-1-189.) R. Vorkink. NBS, Ordnance Development Division. March 8, 1944.
- M32** Field test of twenty-five MC-382 Type S units and twenty-five standard MC-382 units [at] Blossom Point, March 9 and 10, 1944. (Report No. OD-1-197.) R. Vorkink. NBS, Ordnance Development Division. March 15, 1944.
- M33** High-angle test of pellets and salted powders [at] Blossom Point, April 6 and 13, 1944. (Report No. OD-1-241.) D. W. Scott. NBS, Ordnance Development Division. April 18, 1944.
- M34** High-angle test of effect of motors and traps on early function [at] Blossom Point, April 6 and 13, 1944. (Report No. OD-1-253.) D. W. Scott. NBS, Ordnance Development Division. April 22, 1944.
- M35** High-angle test of salted powder [at] Blossom Point, April 18, 1944. (Report No. OD-1-274.) D. W. Scott. NBS, Ordnance Development Division. May 3, 1944.
- M36** Approach function test on projectiles with notched powder loads [at] Blossom Point, May 4, 1944. (Report No. OD-1-287.) D. W. Scott. NBS, Ordnance Development Division. May 27, 1944.
- M37** Field test of seventy-two General Electric MC-382-10A [fuzes at] Blossom Point, June 9, July 6 and 11, 1944. (Report No. OD-1-404.) D. W. Scott. NBS, Ordnance Development Division. July 21, 1944.
- M38** Field test [of] General Electric MC-382 with 10A

amplifier [at] Blossom Point, July 17, 1944. (Report No. OD-1-423.) D. W. Scott. NBS, Ordnance Development Division. July 27, 1944.

- M39** Field test [of] shaker-tested General Electric MC-382-10A [at] Blossom Point, August 10, 1944. (Report No. OD-1-477.) D. W. Scott. NBS, Ordnance Development Division. August 24, 1944.

222.129 Miscellaneous Rocket Fuze Tests

- M1** Proving Ground operations and facilities for testing proximity fuzes for bombs and rockets. (Memorandum No. A-44M.) Lauriston S. Taylor. OSRD No. 719. NBS, Ordnance Development Division. July 20, 1942.
- M2** Note on a practical method for the field testing of radio proximity fuzes for rocket applications. (Memorandum No. A-48M.) Harry M. Diamond and W. S. Hinman, Jr. OSRD No. 767. NBS, Ordnance Development Division. July 30, 1942.
- M3** Relation between early function and after-burning [using] RRP-NBS fuze on Revere 4.5 M-8 motor. Night test [at] Corncake, March 3, 1943. (Report No. OD-1-AB1.) T. N. White. NBS, Ordnance Development Division. March 17, 1943.
- M4** Incidence of early functions with power oscillating detector type fuzes, Westinghouse model, and MC-382 fuzes [of] various manufacture. Comparisons based on target function and high-angle firing tests. (Report No. OD-1-AB12.) T. N. White. NBS, Ordnance Development Division. May 1, 1943.
- M5** High-angle and target tests of twenty-nine Bowen T-50 [and] ten T-5 units on T-22, modified for 6-ft helical launcher [at] Blossom Point, March 16, April 23, September 25 and 26, 1945. (Report No. OD-1-895.) B. M. Bennett. NBS, Ordnance Development Division. October 8, 1945.

222.13 Mortar Fuzes

222.131 T-132

- M1** Test line for T-132 unit, Globe-Union and Wurlitzer model. (Engineering Report No. OD-2-TEG-SR.) Thomas C. Bagg. NBS, Ordnance Development Division. January 30, 1945.
- M2** The T-132 mortar fuze apex performance problem. (Report No. OD-3-220.) William L. Kraushaar. NBS, Ordnance Development Division. March 3, 1945.
- M3** [Field tests of] seventy-three Globe-Union T-132, Lot S-1 [at] Blossom Point, May 24, 1945. (Report No. OD-1-763.) D. C. Friedman. NBS, Ordnance Development Division. June 4, 1945.
- M4** Summary of pre-production mortar fuze, Globe-Union T-132, field test results. (Report No. OD-2-229.) (n.a.) NBS, Ordnance Development Division. June 18 and September 27, 1945.
- M5** Mortar fuze arming time tests. (Report No. OD-2-230.) (n.a.) [NBS, Ordnance Development Division.] June 23 and July 14, 1945.

- M6** Generator-powered radio proximity fuze for mortars, longitudinal excitation type, T-132. Alfred S. Khouri. OEMsr-1117. Globe-Union, Inc. September 30, 1945.

222.132 T-172

- M1** Generator-powered radio proximity fuze for mortars, loop transverse-antenna type. Earl J. Diehl. OEMsr-1477; Service Project No. OD-27. Zenith Radio Corporation. October 30, 1945.

222.133 Miscellaneous Mortar Fuze Tests

- M1** Periodic summaries of mortar fuze field test results. (Report No. OD-7-112.) Paul F. Bartunek and C. F. Smolen. [NBS, Ordnance Development Division.] April 23, 1945.

222.2 Photoelectric Fuzes

222.21 Bomb Fuzes

- M1** Test of bomb-mounted MC-380 fuzes at Aberdeen, April 21, 1943. (Memorandum No. 23-P.) Allen V. Astin. Service Project No. OD-27. NBS, Ordnance Development Division. April 23, 1943.
- M2** Test of five Bell Telephone Laboratory BPEG fuzes [at] Aberdeen, July 19, 1943. (Memorandum No. 387-T.) L. C. Miller. Service Project No. OD-27. NBS, Ordnance Development Division. July 24, 1943.
- M3** Tests for target function and for self-destruction [of] ten Bell Telephone Laboratory BPEG fuzes [at] Aberdeen, August 12, 1943. (Memorandum No. 410-T.) R. Vorkink. Service Project No. OD-27. NBS, Ordnance Development Division. August 17, 1943.

222.22 Rocket Fuzes

222.221 Radio Reporter Tests

- M1** Tests with reporters at Aberdeen. Allen V. Astin. [NBS, Ordnance Development Division.] November 29, 1941.
- M2** Photoelectric range testing at Corncake with reporters. (Memorandum No. PG-209.) Allen V. Astin. [NBS, Ordnance Development Division.] August 21, 1942.
- M3** Photoelectric range tests with radio reporters. (Memorandum No. PG-244.) Allen V. Astin. [NBS, Ordnance Development Division.] September 1, 1942.
- M4** Photoelectric range tests with reporters. (Memorandum No. PG-303.) Allen V. Astin. [NBS, Ordnance Development Division.] September 25, 1942.
- M5** Photocell current measurements with reporters. (Memorandum No. PG-305.) Allen V. Astin. [NBS, Ordnance Development Division.] September 26, 1942.
- M6** Range firing of radio reporters and photoelectric fuzes to determine suitability of range for testing

photoelectric fuzes [at] Blossom Point, Md., December 13, 1942. John F. Streib. [NBS, Ordnance Development Division.] December 16, 1942.

- M7** Yaw reporter test [at] Corncake, July 16, 1943. (Memorandum No. 401-T.) L. C. Miller. Service Project No. OD-27. NBS, Ordnance Development Division. August 9, 1943.

222.222 Condenser-Powered Fuzes

- M1** Proving Ground test of twelve condenser-powered photoelectric units fired on North Range, Fort Fisher, on December 31, 1942. Robert A. Becker and David Feldman. [NBS, Ordnance Development Division.] January 2, 1943.
- M2** [Test of] photoelectric fuzes for 4½ PP rocket, condenser B supply. Report on target function [of] 12 rounds [at] Corncake, December 31, 1942. (Memorandum No. 19-T.) T. N. White. Service Project No. OD-27. NBS, Ordnance Development Division. January 12, 1943.
- M3** Analysis of field tests of condenser-powered photoelectric units [at] Fort Fisher, March 4 and 5, 1943. (Memorandum No. 16-P.) Seth H. Neddermeyer. Service Project No. OD-27. NBS, Ordnance Development Division. March 6, 1943.
- M4** [Test of] fuze, rocket, PEP condenser-powered Westinghouse [at] North Range, Corncake, March 4 and 5, 1943. (Memorandum No. 108-T.) R. Vorkink. Service Project No. OD-27. NBS, Ordnance Development Division. March 23, 1943.
- M5** Range testing at Blossom Point with PEP rocket fuzes, March 20, 1943. [Part] 1, Pre-production WA and NA units. [Part] 2, WC condenser-powered units. (Memorandum No. 116-T.) L. C. Miller. Service Project No. OD-27. NBS, Ordnance Development Division. March 24, 1943.

222.223 M-2 (MC-380) and M-3 (MC-382) Combined Lots

- M1** Proposed proof range for M-2 and M-3 fuzes at Aberdeen Proving Center. (Memorandum No. 1-M.) Harry M. Diamond. Service Project No. OD-27. NBS, Ordnance Development Division. December 29, 1942.
- M2** Tentative specifications for field test set IE-28 for Division 4, NDRC. Allen S. Clarke. [NBS, Ordnance Development Division.] December 31, 1942.
- M3** Further observations on the firing of M-2 and M-3 fuzes on M-8 projectiles at Aberdeen. Theodore B. Godfrey. [NBS, Ordnance Development Division.] May 25, 1943.

222.224 MC-380

- M1** MC-380 mechanical specifications. Clarence B. Crane. [NBS, Ordnance Development Division.] November 2, 1942.
- M2** View-angle and look-forward angle of MC-380A. K. D. Smith. Bell Telephone Laboratories, Inc. November 7, 1942.
- M3** Test of one hundred MC-380B fuze noses for con-

formity to the September 30, 1942 issue of MC-380 fuze nose specifications, Section E, Division A, National Defense Research Committee. [Joseph E. Henderson and] Lyman J. Briggs. [NBS, Ordnance Development Division.] December 21, 1942.

- M4** Range testing at Blossom Point for photoelectric MC-380 fuzes, December 13, 1942. (Memorandum No. 14-T.) Allen V. Astin. Service Project No. OD-27. NBS, Ordnance Development Division. January 5, 1943.
- M5** Three-dimensional analysis of eleven trajectories of PEP-M2 fuzes fired from a plane at Aberdeen, January 23 and 24 [1943]. (Memorandum No. 54-T.) Theodore B. Godfrey. Service Project No. OD-27. NBS, Ordnance Development Division. February 11, 1943.
- M6** Uniformity of MC-380 fuze noses measured with half the lens uniformly illuminated. (Memorandum No. 18-P.) Fred L. Mohler. Service Project No. OD-27. NBS, Ordnance Development Division. [March, 1943.]
- M7** Measurement of light thresholds of MC-380 photoelectric units. Seth H. Neddermeyer. March 13, 1943.
- M8** [Test of] fuze, MC-380-B-Westinghouse, with pentode plate and screen resistor changes [at] Blossom Point, April 14, 1943. (Memorandum No. 167-T.) L. C. Miller. Service Project No. OD-27. NBS, Ordnance Development Division. April 20, 1943.
- M9** Ground firing tests of MC-380 fuzes at Fort Bragg, April 14 to 15, 1943. (Memorandum No. 22-P.) Allen V. Astin. Service Project No. OD-27. NBS, Ordnance Development Division. April 22, 1943.
- M10** Effect of light level on the threshold of MC-380 units. Charles Ravitsky. [NBS, Ordnance Development Division.] May 10, 1943.
- M11** Test of special MC-380-Westinghouse fuzes in connection with the problem of gassy pentodes [at] North Range, Corncake, April 29, 1943. (Memorandum No. 232-T.) L. C. Miller. Service Project No. OD-27. NBS, Ordnance Development Division. May 10, 1943.
- M12** Test of special MC-380-Western Electric fuzes, Veazie circuit, in connection with the problem of gassy pentodes [at] East Range, Blossom Point, May 13, 1943. (Memorandum No. 244-T.) L. C. Miller. Service Project No. OD-27. NBS, Ordnance Development Division. May 19, 1943.
- M13** Test of special MC-380-Western Electric fuzes in connection with the problem of gassy pentodes [at] East Range, Blossom Point, May 28 and 29, 1943. (Memorandum No. 271-T.) L. C. Miller. Service Project No. OD-27. NBS, Ordnance Development Division. June 3, 1943.
- M14** Correlation of laboratory and field tests of MC-380 microphonic rejects. (Report No. OD-2-9.) Allen V. Astin and Philip J. Franklin. NBS, Ordnance Development Division. June 28, 1943.
- M15** Tests of MC-380 units with photocells rejected for

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excessive fragments. (Memorandum Report No. 38-P.) Allen V. Astin and William E. Williams, Jr. Service Project No. OD-27. NBS, Ordnance Development Division. June 29, 1943.

M16 Triggering of MC-380's by poles on the North Range. (Memorandum No. 39-P.) Alexander Orden. NBS, Ordnance Development Division. July 3, 1943.

M17 Experimental MC-380 fuzes fired against small flat target [at] North Range, Corncake, May 27, 29 and 30, 1943. (Memorandum No. 337-T.) T. N. White and Allen V. Astin. Service Project No. OD-27. NBS, Ordnance Development Division. July 7, 1943.

M18 Sunfiring properties of M-2 fuzes. [Part] I, Roof tests on yaw machine. [Part] II, Field tests at Corncake, June 1 to 7, 1943. (Report No. OD-2-1.) Fred L. Mohler. NBS, Ordnance Development Division. July 8, 1943.

M19 Sunfiring of the [MC-]380 fuze as measured on the yaw machine. Fred L. Mohler. [NBS, Ordnance Development Division.] July 8, 1943.

M20 Use of the M-2 fuze. (Report No. OD-2-17.) Allen V. Astin. NBS, Ordnance Development Division. July 15, 1943.

M21 Test on microphonic MC-380 fuzes [at] Blossom Point, July 12, 1943. (Memorandum No. 378-T.) D. C. Friedman. Service Project No. OD-27. NBS, Ordnance Development Division. July 22, 1943.

M22 Use of MC-380's on AN-M-30 at Eglin Field, July 26 through 30, 1943. (Memorandum No. 42-P.) Allen V. Astin. Service Project No. OD-27. NBS, Ordnance Development Division. August 5, 1943.

M23 Test of special MC-380 fuzes designed to prevent sunfiring [at] Corncake, August 25 and 26, 1943. (Memorandum No. 428-T.) L. C. Miller. Service Project No. OD-27. NBS, Ordnance Development Division. September 4, 1943.

M24 Test of twenty-five sunproofed MC-380 fuzes with fifty regular MC-380 controls fired over ground [at] Corncake, October 10, 1943. (Report No. OD-1-36.) R. Vorkink. NBS, Ordnance Development Division. November 8, 1943.

M25 Probability of sunfiring of M-2 fuzes. (Report No. OD-2-4.) Allen V. Astin. NBS, Ordnance Development Division. November 15, 1943.

222.225 RPEB-2

M1 RPEB's fired at Blossom Point on September 9, 1943. Alexander Orden. [NBS, Ordnance Development Division.] September 11, 1943.

M2 Target test of sixty-seven RPEB-2 fuzes with twenty MC-380 controls, using 4-target array [at] Blossom Point, September 9, 1943. (Report No. OD-1-9.) R. Vorkink. NBS, Ordnance Development Division. September 20, 1943.

M3 Target test of seventy-nine RPEB-2 fuzes, Glidden compound, with thirty MC-380 controls, using

4-target array [at] Blossom Point, October 2, 1943. (Report No. OD-1-25.) R. Vorkink. NBS, Ordnance Development Division. October 14, 1943.

M4 Laboratory and field tests on RPEB-2 fuze. (Report No. OD-2-3.) Allen V. Astin and Alexander Orden. NBS, Ordnance Development Division. October 23, 1943.

222.226 Miscellaneous Rocket Fuze Tests

M1 Manufacturing testing requirements for parts and assemblies used in photoelectric rocket fuze apparatus, Western Electric Company Model BR. (Specification No. X-61636, Issue 4.) (n.a.) Bell Telephone Laboratories, Inc. March 9, 1942.

M2 [Test of] fuze, PEP-M2, Westinghouse special MC-380 microphonic rejects [at] Corncake, June 17, 1943. (Memorandum No. 348-T.) R. Vorkink. Service Project No. OD-27. NBS, Ordnance Development Division. July 7, 1943.

222.23 Miscellaneous Photoelectric Fuze Tests

M1 Preliminary test on night operation of photoelectric fuze, Western Electric Company Model AR, with light source carried by projectile, by means of falling spheres. John F. Streib. [NBS, Ordnance Development Division.] April 17, 1942.

M2 Manufacturing specifications for first fifty units to be manufactured by Westinghouse. [Seth H. Neddermeyer.] [NBS, Ordnance Development Division.] June 6, 1942.

M3 Firing photoelectric fuzes [at] Fort Fisher, August 6 to 9, 1942. Kite target; North Range; zero-stage units; ground target on beach; Radio Range. Robert Hofstadter and John F. Streib. [NBS, Ordnance Development Division.] August 12, 1942.

M4 Tests of photoelectric fuzes on rotating 4½-inch Budd rockets, March 1, 1943. (Memorandum No. 17-P.) Seth H. Neddermeyer. Service Project No. OD-27. NBS, Ordnance Development Division. March 26, 1943.

M5 Analysis of proving ground data on experimental Bureau of Standards and Westinghouse proximity fuzes fired at Fort Fisher. Joseph E. Henderson, Seth H. Neddermeyer and others. [NBS, Ordnance Development Division.] May, 1943.

M6 Trips to Aberdeen to observe firing photoelectric and radio fuzes on motors loaded with high explosives. Fred L. Mohler. [NBS, Ordnance Development Division.] May 25, 1943.

230 Fuze Components

231 Electronic Tubes

M1 Specifications for the manufacture and testing of the SA-780A triode, SA-781A pentode and SA-782B thyatron for Section E, Division A, NDRC. [Cledo Brunetti.] [NBS, Ordnance Development Division.] September 30, 1942.

M2 A study of the development of the specifications for NR-2A diode, NR-3/NS-3 triode, NS-4 thyr-

tron and NR-5/NS-5 pentode, dated August 1, 1944. (Report No. OD-5-671.) (n.a.) NBS, Ordnance Development Division. October 20, 1944.

M3 [Development of special electronic devices.] Final report on Contract OEMsr-1003. (Report No. 1003-1.) Alan M. Glover and Arnold R. Moore. OEMsr-1003. Radio Corporation of America. October 23, 1944.

M4 [Electronic tubes.] Final report [on] Contract OEMsr-630. (n.a.) OEMsr-630. Sylvania Electric Products, Inc. [1945.]

M5 [Vacuum tubes, Types NR-2 (2B-24), NR-3 (2C-27) and NR-5 (2E-27).] Final summary report [on] Contract OEMsr-566. A. Abate. OEMsr-566. Raytheon Manufacturing Company. October 1, 1945.

231.1 Thyratrons

M1 Firing of squibs by condenser discharge. Energy losses in thyratrons. (Progress Report No. A-65.) Evert G. Bennett and Richard K. Cook. Service Project Nos. OD-27, OD-33 and others. NBS, Ordnance Development Division. June 25, 1942.

M2 Proposed specifications for the manufacture and inspection of a GY-2 thyatron tube. (Draft No. 6.) (n.a.) [NBS, Ordnance Development Division.] September 30, 1942.

M3 Specifications for the manufacture and inspection of a microthyatron tube. (n.a.) [NBS, Ordnance Development Division.] November 6, 1942.

M4 Characteristics of small thyratrons for use in proximity fuzes. (Progress Report No. A-112.) Mahlon F. Peck. Service Project Nos. OD-27, OD-33 and others. [NBS, Ordnance Development Division.] November 19, 1942.

M5 Repeated surges of thyratrons. R. F. Morrison, Jr. [NBS, Ordnance Development Division.] February 24, 1943.

M6 Photothyratrons. R. F. Morrison, Jr. [NBS, Ordnance Development Division.] March 17, 1943.

M7 Critical grid voltage of thyatron and hum voltage output of BRLG-11. (Report No. OD-3-9.) F. Lamar Cooke. [NBS, Ordnance Development Division.] October 27, 1943.

M8 Methods of measuring the critical voltage of thyratrons. (Report No. OD-3-13.) F. Lamar Cooke. NBS, Ordnance Development Division. Revised: November 9, 1943.

M9 Relation of thyatron repeated-surge performance to time delay. (Report No. OD-CT-M8.) Abraham Silverstein. [NBS, Ordnance Development Division.] October 4, 1944.

M10 Grid current in the No. 2050 thyatron tube. (Report No. OD-SP-84.) Harold N. Cones, R. W. Gustafson and Robert L. Nutter. NBS, Ordnance Development Division. February 8, 1945.

M11 Thyatron normal critical voltages for various amplifiers. (Report No. OD-3-249.) George Nordquist. NBS, Ordnance Development Division. May 24, 1945.

M12 Comments on report on [No.] 2050 tubes by G. E. Johnson to Lt. Bolser, July 20, 1945. (Memorandum No. OD-SP-130M.) V. W. Cohen. [NBS, Ordnance Development Division.] August 27, 1945.

231.11 Tests

M1 Reliability of firing and time test on SA-782B, Sylvania thyratrons. (Memorandum No. PG-412.) W. A. Yates. [NBS, Ordnance Development Division.] December 2, 1942.

M2 Tests on No. 2050 thyratrons in Magnavox and National Bureau of Standards test units. Effectiveness of heat curing the thyratrons. (Report No. OD-SP-95.) Harold N. Cones. NBS, Ordnance Development Division. April 16, 1945.

M3 Thyatron tube tester. (Report No. OD-SP-120 and addendum.) V. W. Cohen. NBS, Ordnance Development Division. June 23 and July 10, 1945.

M4 Test unit, Mark 17, for thyatron tests. (Report No. OD-5-224.) M. Schulkin. NBS, Ordnance Development Division. July 9, 1945.

231.2 Diodes

M1 Noise performance of Raytheon diodes. (Report No. OD-5-224.) M. Schulkin. NBS, Ordnance Development Division. December 7, 1943.

M2 BRLG tuning on various vehicles. (Report No. OD-3-106 and Addendum No. OD-3-106A.) Bertrand J. Miller and Charles C. Gordon. NBS, Ordnance Development Division. March 3 and 20, 1944.

M3 Specification for electron tube NR-2A, a diode tube. (n.a.) August 1, 1944.

231.3 Triodes

M1 Uniformity of Raytheon triodes in reaction grid detection. (Report No. OD-3-149.) Chester H. Page. NBS, Ordnance Development Division. May 13, 1944.

M2 Triode microphonics. (Report No. OD-3-153.) Robert D. Huntoon, Bertrand J. Miller and R. B. Schwartz. NBS, Ordnance Development Division. May 20, 1944.

M3 A high-gain amplifier employing a twin triode tube. (Report No. OD-BE-47R.) Thomas M. Marion. NBS, Ordnance Development Division. October 18, 1944.

231.4 Pentodes

M1 Testing of pentodes. Robert A. Becker. [NBS, Ordnance Development Division.] April 28, 1942.

M2 Gas currents and input impedance of HY-145-YT. Robert A. Becker. [NBS, Ordnance Development Division.] August 1, 1942.

M3 Centrifuging of twenty-four HY-145-YT pentodes to 2000 g. Robert A. Becker and Charles Ravitsky. [NBS, Ordnance Development Division.] September 19, 1942.

M4 Effect of variation of grid resistor on initial input impedance and performance of one-stage photo-

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electric unit. Robert A. Becker and David Feldman. (NBS, Ordnance Development Division.) September 29, 1942.

- M5 Specifications for HY-145-ZT pentodes for photoelectric proximity fuzes. Robert A. Becker. (NBS, Ordnance Development Division.) September 30, 1942.
- M6 Input impedance of Hytron 145-ZT pentodes. David Feldman. (NBS, Ordnance Development Division.) November 16, 1942.
- M7 Testing of HY-145-ZT pentodes. (n.a.) (NBS, Ordnance Development Division.) November 27, 1942.
- M8 Tube constants of pentodes used in the MC-380 and condenser unit circuits. David Feldman. (NBS, Ordnance Development Division.) February 27, 1943.
- M9 Heater cathode pentodes. A preliminary report. David Feldman. (NBS, Ordnance Development Division.) April 5, 1943.
- M10 (The) SA-804 slow-cooling pentodes. David Feldman. (NBS, Ordnance Development Division.) April 22, 1943.
- M11 Circuit parameters suitable for use with General Electric pentodes in the MC-380 unit. (Report No. OD-2-11.) Ralph Stair and Seymour Golden. NBS, Ordnance Development Division. July 8, 1943.
- M12 Pentode input impedance. (Report No. OD-3-254.) George Nordquist. NBS, Ordnance Development Division. May 31, 1945.

231.5 Photocells

- M1 Test specification, tentative (for) photocell RCA-936, formerly C-7063. (Draft No. 5.) (n.a.) (NBS, Ordnance Development Division.) September 30, 1942.
- M2 Results of tests on forty-four General Electric photocells to determine the effect of change of illumination on sensitivity. William E. Williams, Jr. (NBS, Ordnance Development Division.) January 7, 1943.
- M3 Results of tests on thirty General Electric photocells to determine the effect of change of illumination on sensitivity. William E. Williams, Jr. (NBS, Ordnance Development Division.) January 9, 1943.
- M4 Effect of light and heat on photocell sensitivity. (Memorandum No. 3-P.) William E. Williams, Jr. Service Project No. OD-27. NBS, Ordnance Development Division. January 15, 1943.
- M5 Special phototube investigation in Research Laboratory. (Report (covering the period from) June 1, 1942 to January 31, 1943.) Saul Dushman. General Electric Company. February 2, 1943.
- M6 Photocell specifications. Gas multiplication ratio. John F. Streib. (NBS, Ordnance Development Division.) March 5, 1943.
- M7 Photocell specifications. Uniformity. John F.

Streib. (NBS, Ordnance Development Division.) March 8, 1943.

- M8 Photocell specifications. Flat region on seat. John F. Streib. (NBS, Ordnance Development Division.) March 8, 1943.
- M9 Photocell specifications. Tinning tabs. John F. Streib. (NBS, Ordnance Development Division.) March 8, 1943.
- M10 Gas-filled RCA-936 photocells. Thomas M. Marion. (NBS, Ordnance Development Division.) March 29, 1943.
- M11 Progress in phototube work. (Interim Report No. 171 (covering period from) March 2 to April 8, 1943.) Saul Dushman. OEMsr-611. General Electric Company. April, 1943.
- M12 Results of electrical and mechanical tests on ninety-five General Electric photocells received April 14, 1943. William E. Williams, Jr. (NBS, Ordnance Development Division.) April 19, 1943.
- M13 Photocell. (NBS Diagram No. L-5017.) (n.a.) NBS, Ordnance Development Division. May 27, 1943.
- M14 (The) $\frac{3}{8}$ -inch and $\frac{1}{2}$ -inch phototubes. (Weekly Progress Report for May 29, 1943.) Saul Dushman. OEMsr-611. General Electric Company. May 31, 1943.
- M15 Specifications for electron tube, NN-1. Description (of the) photocell. (n.a.) June 1, 1943.
- M16 Small General Electric photocells received May 22, 1943. (Memorandum No. 34-P.) William E. Williams, Jr. Service Project No. OD-27. NBS, Ordnance Development Division. June 7, 1943.
- M17 High-sensitivity photocells. Allen V. Astin. (NBS, Ordnance Development Division.) June 10, 1943.
- M18 Spectral response of Types GL-516 and GL-564, General Electric photocells. (Report No. OD-2-5.) Ralph Stair and William E. Williams, Jr. NBS, Ordnance Development Division. June 19, 1943.
- M19 Leakage of gas into General Electric GL-564 photocells. (Report No. OD-2-17.) William E. Williams, Jr. NBS, Ordnance Development Division. August 28, 1943.
- M20 Results of tests on four hundred Radio Corporation of America photocells, Type 936, received June 15, 1943. (Report No. OD-2-19.) William E. Williams, Jr. NBS, Ordnance Development Division. September 6, 1943.
- M21 Results of tests on two thousand General Electric photocells, Type 1P-24, received July 8 and 17, 1943. (Report No. OD-2-20.) William E. Williams, Jr. NBS, Ordnance Development Division. September 7, 1943.

231.51 Double Photocells

- M1 A double photocell photoelectric unit. Robert Hofstadter and R. F. Morrison, Jr. (NBS, Ordnance Development Division.) November 11, 1942.
- M2 Theoretical voltage output from a double photo-

cell circuit. Robert Hofstadter. [NBS, Ordnance Development Division.] November 12, 1942.

M3 Double photocell circuit. Thomas M. Marion. [NBS, Ordnance Development Division.] December 11, 1942.

M4 Operation of parallel, double photocell circuit. Thomas M. Marion. [NBS, Ordnance Development Division.] December 12, 1942.

M5 Notes on double photoelectric cell input circuit. [J. G. Hoffman.] [NBS, Ordnance Development Division.] [August 12, 1943.]

231.52 Test Equipment

M1 Standard photoelectric cell mount. (NBS Diagram No. 3012.) (n.a.) NBS, Ordnance Development Division. October 5, 1942.

M2 Shutter and baffle. (NBS Diagram No. 3013.) (n.a.) NBS, Ordnance Development Division. October 6, 1942.

M3 Test cell mount assembly. (NBS Diagram No. 3014.) (n.a.) NBS, Ordnance Development Division. October 7, 1942.

M4 Test cell mount details. (NBS Diagram Nos. 3015 and 3016.) (n.a.) NBS, Ordnance Development Division. October 7, 1942.

M5 Lamp socket. (NBS Diagram No. 3017.) (n.a.) NBS, Ordnance Development Division. October 14, 1942.

M6 Number 1 photoelectric cell test unit cabinet. (NBS Diagram No. 3018.) (n.a.) NBS, Ordnance Development Division. October 21, 1942.

M7 Number 2 photoelectric cell test unit cabinet. (NBS Diagram No. 3019.) (n.a.) NBS, Ordnance Development Division. October 21, 1942.

M8 Light angle device wiring diagram. (NBS Diagram No. A-3164.) (n.a.) NBS, Ordnance Development Division. August 3, 1943.

231.6 Neon Tubes

M1 Suggested form of specifications for the manufacture and inspection of a neon tube. [Robert Hofstadter.] [NBS, Ordnance Development Division.] December 16, 1942.

M2 Radium treatment of neon lamps. Clelio Brunetti. [NBS, Ordnance Development Division.] May 13, 1943.

232 Power Supplies

232.1 Batteries

M1 The performance of small dry batteries when subjected to low air temperatures and the effect of heating the batteries internally by alternating current supplied to the battery terminals. (Progress Report No. A-30.) John P. Schrodt, D. Norman Craig and George W. Vinal. Service Project No. OD-27. NBS, Ordnance Development Division. January 26, 1942.

M2 The National Bureau of Standards battery for low-temperature operation. (Progress Report No.

A-49.) John P. Schrodt, D. Norman Craig and George W. Vinal. Service Project No. OD-27. NBS, Ordnance Development Division. May 7, 1942.

M3 Proposed specifications for the manufacture and inspection of a battery. [Clelio Brunetti.] NBS, Ordnance Development Division. September 1, 1942.

M4 Operation of a single-stage unit without a B battery. Robert A. Becker and Charles Ravitsky. [NBS, Ordnance Development Division.] November 11, 1942.

M5 Test of reserve batteries at Corncake, March 10, 1943. (Memorandum No. 117-T.) Allen V. Astin and A. W. Spinks. Service Project No. OD-27. NBS, Ordnance Development Division. March 24, 1943.

M6 Status of reserve batteries. Allen V. Astin. [NBS, Ordnance Development Division.] April 17, 1943.

M7 Test of Willard reserve A cell. Alexander Orden. [NBS, Ordnance Development Division.] July 29, 1943.

M8 [Battery requirements for Project K-4.] C. B. Pear, Jr. OEMsr-887. Washington Institute of Technology. February 17, 1944.

M9 [The development of small, low-temperature batteries.] F. T. Bowditch. OEMsr-528. National Carbon Company, Inc. October 26, 1944.

232.2 Generators

M1 The possibility of a generator power supply for proximity fuzes. (Report No. A-62M.) Allen S. Clarke. Service Project Nos. OD-27, OD-33 and others. NBS, Ordnance Development Division. December, 1942.

M2 Generator report. R. N. Harmon. Westinghouse Electric and Manufacturing Company, Inc. April 8, 1943.

M3 Status of generator development. (Memorandum No. 38-R.) R. N. Harmon. Service Project No. OD-27. Westinghouse Electric and Manufacturing Company, Inc. April 8, 1943.

M4 Generator regulation. (Memorandum No. 40-R.) Chester H. Page. Service Project No. OD-27. NBS, Ordnance Development Division. April 26, 1943.

M5 The adaptation of the photoelectric fuze to a generator power supply. (Memorandum No. 29-P.) John F. Streib, David Feldman and Willis E. Armstrong. Service Project No. OD-27. NBS, Ordnance Development Division. April 30, 1943.

M6 Status of generator development. (Engineering Report No. 3-R.) George V. Morris. Service Project No. OD-27. Zenith Radio Corporation. May 27, 1943.

M7 Development [of a] 1 7/16-inch diameter generator for fuze well. George V. Morris. [OEMsr-980.] Zenith Radio Corporation. October 8, 1943.

M8 Generator performance. (Report No. OD-3-17.)

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- William L. Kraushaar. NBS, Ordnance Development Division. November 1, 1943.
- M9** Performance of power supply at high and low temperature. (Report No. OD-3-23.) F. Stanley Atchison. NBS, Ordnance Development Division. November 6, 1943.
- M10** Effect of tolerances in the regulation network. (Report No. OD-3-60.) William L. Kraushaar. NBS, Ordnance Development Division. December 17, 1943.
- M11** [Generators.] Final report [for] Contract OEMsr-981. C. W. Clemons. OEMsr-981. Knapp-Monarch Company. February 17, 1944.
- M12** Investigation of design features of Westinghouse MK generators. (Report No. OD-2-20.) J. G. Reid, Jr. and Charles Ravitsky. NBS, Ordnance Development Division. February 23, 1944.
- M13** BRLG generator speeds for several combinations of vehicle, propeller lead and manufacturer. (Report No. OD-1-256.) D. C. Friedman. NBS, Ordnance Development Division. May 22, 1944.
- M14** Variation of generator speeds of BRLG units with manufacturer. (Supplementary Report No. OD-1-256A.) D. C. Friedman. NBS, Ordnance Development Division. June 6, 1944.
- M15** Voltage-speed regulation of Zenith generators. (Report No. OD-3-167.) Morris Brenner and Ralph L. Ueberall. NBS, Ordnance Development Division. July 1, 1944.
- M16** Effect of generator end play on electrical noise output. (Report No. OD-4-81.) Louis Schuman and A. Donald Arsem. NBS, Ordnance Development Division. September 7, 1944.
- M17** A study of the development of the NDRC specification for generator G-1, dated February 25, 1944. (Report No. OD-5-645.) (n.a.) NBS, Ordnance Development Division. October 6, 1944.
- M18** Test of four types of power supplies and generators, Quam-Nichols, Utah, Knapp-Monarch and Wurlitzer. (Report No. OD-3-193.) Ralph L. Ueberall. NBS, Ordnance Development Division. November 9, 1944.
- M19** [Alnico rotor generators.] Final report [for] Contract OEMsr-1134. C. W. Clemons. OEMsr-1134. Knapp-Monarch Company. November 20, 1944.
- M20** Specification for generator G-1. (n.a.) NBS, Ordnance Development Division. November 25, 1944.
- M21** Specification for power supply, PS-1 and PS-2. (n.a.) [NBS, Ordnance Development Division.] November 25, 1944.
- M22** Plate voltage fluctuations of generator power supplies. (Report No. OD-3-210.) Ralph Stair, James H. Barnard and Leonard C. Pochop. NBS, Ordnance Development Division. January 22, 1945.
- M23** Frequency modulation in generators. (Preliminary Report No. OD-3-223P.) Ralph Stair and Glenn L. Scillian. NBS, Ordnance Development Division. March 12, 1945.
- M24** Supporting the T-132 and T-32 generator to take setback. (Report No. OD-4-101.) Louis Schuman. NBS, Ordnance Development Division. March 15, 1945.
- M25** Air speed-generator output regulation for the mortar shell fuzes. (Report No. OD-3-278.) Glenn L. Scillian and L. M. Andrews. NBS, Ordnance Development Division. July 20, 1945.
- M26** Effect of different regulation networks on T-132 generator speeds. (Report No. OD-3-286.) Glenn L. Scillian. NBS, Ordnance Development Division. September 19, 1945.
- 232.21 Propellers**
- M1** Speed-regulating propellers. (Report No. OD-4-11.) Jacob Rabinow. NBS, Ordnance Development Division. December 4, 1943.
- M2** Six speed-regulating propellers on BRLG self-reporters. Test [at] Aberdeen, December 1, 1943. (Report No. OD-1-76.) D. C. Friedman. NBS, Ordnance Development Division. December 11, 1943.
- M3** Propeller torque at low velocity. (Report No. OD-4-19.) L. M. Andrews. NBS, Ordnance Development Division. December 21, 1943.
- M4** Six speed-regulating propellers on self-reporters. [Test at] Aberdeen, January 23, 1944. (Report No. OD-1-126.) D. C. Friedman. NBS, Ordnance Development Division. January 31, 1944.
- M5** Measurement of dynamic propeller unbalance. (Report No. OD-4-43.) E. U. Rotor and L. G. Koontz. NBS, Ordnance Development Division. March 23, 1944.
- M6** Comparative speeds of brass and bakelite propellers. (Report No. OD-4-45.) Louis Schuman. NBS, Ordnance Development Division. April 6, 1944.
- M7** Torque developed by 2-inch x 12-inch RRLG propellers. (Report No. OD-4-51.) Samuel Kolodny. NBS, Ordnance Development Division. April 19, 1944.
- M8** Speed tests of stamped brass and duralumin propellers. (Report No. OD-4-60.) Louis Schuman. NBS, Ordnance Development Division. May 22, 1944.
- M9** Speed of 1 1/16-inch diameter steel propellers. (Supplement [No. 1] to Report No. OD-4-60.) Louis Schuman. NBS, Ordnance Development Division. May 27, 1944.
- M10** Speed test of 1 1/2-inch diameter 11-blade steel propellers. (Supplement No. 2 to Report No. OD-4-60.) Louis Schuman. NBS, Ordnance Development Division. May 31, 1944.
- M11** Speed test of stamped duralumin propellers. (Supplement No. 3 to Report No. OD-4-60.) Louis Schuman. NBS, Ordnance Development Division. June 5, 1944.
- M12** Speed test of cut steel propellers. (Supplement to Report No. OD-4-45.) Louis Schuman. NBS, Ordnance Development Division. June 19, 1944.
- M13** Metal propeller with fluted blades. Jacob Rabi-

now. [NBS, Ordnance Development Division, November 1, 1944.

- M14** Effect of varying blade length and cover openings on speed characteristics and air thrust on turbine wheel, TFA-6070. (Report No. OD-4-91.) Louis Schuman. NBS, Ordnance Development Division. December 29, 1944.

232.22 Rotors

- M1** Rubber-mounted generator rotors. William B. McLean. [NBS, Ordnance Development Division, September 1, 1943.
- M2** Contact springs on the BRLG rotor housing. William B. McLean. [NBS, Ordnance Development Division, October 8, 1943.
- M3** Comparison of generator rotor unbalance and the measured eccentricity. (Report No. OD-4-20.) A. Donald Arsem. NBS, Ordnance Development Division. December 27, 1943.
- M4** Bursting speeds of generator rotors. (Report No. OD-4-36.) Samuel Kolodny. NBS, Ordnance Development Division. February 23, 1944.
- M5** Measurement of vibration amplitude of MRLG units. (Report No. OD-4-73.) A. Chartock. NBS, Ordnance Development Division. June 14, 1944.
- M6** Fifty Indiana Steel and Arnold Engineering rotors submitted for test by Bowen and Company. (Report No. OD-4-97.) Samuel Kolodny. NBS, Ordnance Development Division. March 2, 1945.
- M7** Compilation of performance of various rotors tested for bursting speed. (Memorandum No. OD-4-50M.) Samuel Kolodny. [NBS, Ordnance Development Division, April 28, 1945.
- M8** Clock rotor for the T-132/T-171. (Memorandum No. OD-4-67M.) Jacob Rabinow. [NBS, Ordnance Development Division, June 21, 1945.
- M9** Correlation of rotor magnetic characteristics with generator output. (Report No. OD-3-269.) Glenn L. Scillian and Ralph L. Ueberall. NBS, Ordnance Development Division. July 5, 1945.

232.23 Bearings

- M1** Absolute frictional torque of generator bearings. (Report No. OD-4-7.) A. Chartock and L. B. Heilprin. NBS, Ordnance Development Division. November 29, 1943.
- M2** Instructions for installation of oilite bearings in BRLG generators. William B. McLean. NBS, Ordnance Development Division. May 4, 1944.
- M3** Life test on oilite bearings of MRLG units. (Report No. OD-4-74.) A. Chartock. NBS, Ordnance Development Division. June 16, 1944.
- M4** Determination of static thrust load limit for the 1/2-inch New Departure R-3 ball bearing. (Report No. OD-4-83.) A. Chartock. NBS, Ordnance Development Division. September 19, 1944.
- M5** Coupling shaft in front bearing assemblies. Jacob Rabinow. [NBS, Ordnance Development Division, November 13, 1944.
- M6** The use of precision bearings in BRLG and T-50

noses. (Report No. OD-4-88.) Jacob Rabinow. NBS, Ordnance Development Division. December 14, 1944.

- M7** [Bearings.] Visit to New Departure, January 5, 1945. (Memorandum No. OD-4-11M.) Jacob Rabinow. [NBS, Ordnance Development Division, January 11, 1945.

- M8** Investigation of rotative system of VT-172 and VT-132 units. L. M. K. Boelter. University of California. October, 1945.

- M9** Nitrided bearings. (Report No. OD-4-132.) Ermo Furlani and Jacob Rabinow. NBS, Ordnance Development Division. November 6, 1945.

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Antennas

- M1** Induction field sensitivity. (Report No. OD-3-30.) Chester H. Page. NBS, Ordnance Development Division. November 16, 1943.
- M2** Induction field of finite antennas. (Report No. OD-3-33.) Chester H. Page. NBS, Ordnance Development Division. November 19, 1943.
- M3** Dummy antennas. (Report No. OD-3-133.) Robert D. Huntoon. NBS, Ordnance Development Division. April 20, 1944.
- M4** Antenna rings for BRLG. (Report No. OD-3-162.) Philip Krupen. NBS, Ordnance Development Division. June 15, 1944.
- M5** Interaction of loop antenna and neighboring conductors with special reference to the MROG fuze. (Report No. WRL-UF-3.) R. C. Williamson. University of Florida. August 10, 1944.
- M6** Radio frequency sensitivity of the Zenith T-172 unit and variations thereof. (Report No. OD-7-214R.) Otto E. Spokas. NBS, Ordnance Development Division. August 13, 1945.
- M7** Four reports on MROG, T-172, antenna modifications. (Report No. WRL-UF-12.) Alfred S. Khouri. University of Florida. September 21, 1945.

233.1

Tuning and Loading of Fuzes

- M1** Tuning and loading device for BRLG. (Report No. OD-3-37.) Paul E. Landis. NBS, Ordnance Development Division. November 29, 1943.
- M2** Tuning BRLG. (Report No. OD-3-87.) Robert D. Huntoon. [NBS, Ordnance Development Division, January 29, 1944.
- M3** Loading circuit for final test chamber to be used at W frequency, and encasing cup specification. (Report No. OD-3-126.) Thomas C. Bagg. NBS, Ordnance Development Division. April 1, 1944.
- M4** Preliminary investigation of characteristics of test chamber, with respect to relative position of unit therein. (Report No. OD-3-135.) J. L. Pike and Otto E. Spokas. NBS, Ordnance Development Division. April 25, 1944.
- M5** Tuning compromise for BRLG units. (Report No. OD-3-139.) Philip R. Karr and Otto E. Spokas. NBS, Ordnance Development Division. Revised: June 3, 1944.
- M6** Noise differences in final test chambers. (Memo-

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random No. OD-BE-11M.) Robert D. Huntoon. [NBS, Ordnance Development Division.] June 26, 1944.

- M7 Resonant loading of BRTG units by test boxes. (Report No. OD-3-196.) Ralph Stair, Glenn L. Scillian and Leonard C. Pochop. NBS, Ordnance Development Division. November 13, 1944.
- M8 Loading device for BRTG units. (Memorandum No. OD-5-88M.) L. A. Riley and G. J. Tedore. [NBS, Ordnance Development Division.] December 26, 1944.

234 Lenses

- M1 Resolving power of Westinghouse lenses and position of photocell. Effective aperture. Fred L. Mohler. [NBS, Ordnance Development Division.] September 11, 1942.
- M2 Inspection of lenses. Fred L. Mohler. [NBS, Ordnance Development Division.] September 18, 1942.
- M3 Recommendations for quality inspection of lenses in the manufacturing plant. [Fred L. Mohler.] [NBS, Ordnance Development Division.] October 20, 1942.
- M4 Double lenses. Fred L. Mohler. [NBS, Ordnance Development Division.] November 13, 1942 and July 17, 1943.
- M5 [Crazing and stresses in BR-type lenses.] (Case No. 23826.) W. O. Baker, J. H. Heiss, Jr. and N. R. Pape. [Bell Telephone Laboratories, Inc.] November 27, 1942.
- M6 [PRR lucite injection-molded lenses.] (Case No. 23854.) W. O. Baker, J. H. Heiss, Jr. and N. R. Pape. Bell Telephone Laboratories, Inc. November 28, 1942.
- M7 Specifications or standards for inspection of BR lenses. Fred L. Mohler. NBS, Ordnance Development Division. November 30, 1942.

234.1 Non-Crazing Coatings

- M1 Paint formulation for methyl methacrylate resins. Philip J. Franklin. [NBS, Ordnance Development Division.] January 18, 1943.
- M2 Paint to minimize crazing. Philip J. Franklin. [NBS, Ordnance Development Division.] April 7, 1943.
- M3 Recommendation of non-crazing surface coating for lucite. Philip J. Franklin. [NBS, Ordnance Development Division.] April 12, 1943.

235 Rectifiers

- M1 Status report of Rectifier Sub-Group. (Report No. OD-3-I.) F. Stanley Atchison. NBS, Ordnance Development Division. August 11, 1943.
- M2 Performance of Westinghouse AQ copper-oxide rectifying cells. (Report No. OD-3-VII.) F. Stanley Atchison. NBS, Ordnance Development Division. August 24, 1943.
- M3 Effect of static characteristics of rectifier cells on A and B voltages. (Report No. OD-3-IX.) F. Stan-

ley Atchison. NBS, Ordnance Development Division. September 15, 1943.

- M4 [Development of the 7-mm rectifier disc.] T. Smith Taylor. OEMsr-941. Federal Telephone and Radio Corporation. October 5, 1943.
- M5 Discussion of proposed rectifier specifications. (Report No. OD-3-28.) F. Stanley Atchison. NBS, Ordnance Development Division. November 15, 1943.
- M6 Specification for rectifier bridge assembly, RA-1. (n.a.) NBS, Ordnance Development Division. July 5, 1944.
- M7 A study of the development of the specification for the rectifier bridge assembly, RA-1, of July 5, 1944. (Report No. OD-5-637.) (n.a.) NBS, Ordnance Development Division. October 4, 1944.

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Resistors

- M1 Effect of variation of grid resistor on initial input impedance and performance of one-stage photoelectric unit. Robert A. Becker and David Feldman. [NBS, Ordnance Development Division.] September 29, 1942.
- M2 Regulation with non-linear resistors in series with the load current. (Report No. OD-2-7.) J. G. Hoffman. NBS, Ordnance Development Division. January 1, 1944.
- M3 Arming resistor for T-5. (Report No. OD-3-101.) Robert D. Huntoon. NBS, Ordnance Development Division. February 22, 1944.
- M4 Compensated resistors for tuning and loading standards. (Report No. OD-3-154.) E. Eisner and Paul T. Hawes. NBS, Ordnance Development Division. May 24, 1944.
- M5 Temperature cycling of IRC BW-1 and miscellaneous other resistors. (Report No. OD-SP-47.) A. E. Peterson and F. O. Harrer. NBS, Ordnance Development Division. October 27, 1944.
- M6 Temperature cycling of IRC BW-1 resistors. (Report No. OD-SP-47a.) A. E. Peterson and F. O. Harrer. NBS, Ordnance Development Division. November 28, 1944.
- M7 Compensated tuning resistors used in tuning T-30 fuzes for aircraft rockets, AR and HVAR. (Report No. OD-2-TEG-6R.) Paul T. Hawes and Thomas C. Bagg. NBS, Ordnance Development Division. December 14, 1944.
- M8 Temperature cycling of precision wire-wound resistors, December 30, 1944 to January 6, 1945. (Report No. OD-SP-75.) F. O. Harrer and Harold N. Cones. NBS, Ordnance Development Division. January 11, 1945.
- M9 Temperature cycling tests on Shallcross resistors. (Memorandum No. MA-12-2-44.) George S. Carson. OEMsr-769. State University of Iowa. Revised: January 27, 1945.
- M10 Minimum-segment K-block design. (Report No. OD-SP-83.) Albert London and Ray F. Smith, Jr. NBS, Ordnance Development Division. February 9, 1945.

- M11** Temperature coefficient of Allen-Bradley, Erie [and] Continental Carbon one-third watt and IRC one-fourth watt resistors. (Report No. OD-3-222.) F. W. Jirauch. NBS, Ordnance Development Division. March 2, 1945.
- M12** Possible uses of non-linear resistors. (Memorandum No. OD-3-99M.) Philip Krupen. [NBS, Ordnance Development Division.] May 15, 1945.
- 236.1 Varistors**
- M1** Varistor thyrite material. Robert A. Becker. [NBS, Ordnance Development Division.] March 28, 1942.
- M2** Development of thyrite. Robert Hofstadter. [NBS, Ordnance Development Division.] July 6, 1942.
- M3** Varistor behavior at different temperatures. Robert Hofstadter, Willis E. Armstrong and others. [NBS, Ordnance Development Division.] September 14, 1942.
- M4** Test specifications, tentative [for] varistor or thyrite units. (Draft No. 4.) [Robert Hofstadter.] [NBS, Ordnance Development Division.] September 29, 1942.
- M5** Humidity tests on varistor specifications. Robert Hofstadter. [NBS, Ordnance Development Division.] November 17, 1942.
- M6** [A] 24-hour humidity test on thyrite units and varistors. R. F. Morrison, Jr. [NBS, Ordnance Development Division.] December 2, 1942.
- 237 Condensers**
- M1** Status of condenser unit. Allen V. Astin. [NBS, Ordnance Development Division.] April 12, 1943.
- M2** Study of condensers with solid and liquid dielectrics. (Report No. WRL-UF-10.) H. L. Knowles and D. C. Swanson. University of Florida. January 19, 1944.
- M3** Surge current performance and requirements of BRLG filter condensers. (Report No. OD-5-594.) Willis E. Armstrong. NBS, Ordnance Development Division. Revised: September 13, 1944.
- M4** Minimum capacity requirements for the BRLG filter condensers. (Report No. OD-5-655.) Willis E. Armstrong. NBS, Ordnance Development Division. October 10, 1944.
- M5** Use of off-tolerance condensers in the 10-E amplifier. (Report No. OD-3-195.) George Nordquist. [NBS, Ordnance Development Division.] November 11, 1944.
- M6** Use of T-30 filter with Wurlitzer generator. (Report No. OD-3-214.) Chester H. Page. NBS, Ordnance Development Division. January 31, 1945.
- M7** Temperature coefficient of condensers used in the 10-E amplifier. (Memorandum No. OD-6-86M.) F. W. Jirauch. [NBS, Ordnance Development Division.] February 24, 1945.
- M8** Change in T-91 amplifier to obtain longer trimmer condenser. (Report No. OD-5-769.) Clelio Brunetti and George Nordquist. NBS, Ordnance Development Division. April 2, 1945.
- M9** Temperature characteristics of the ceramic condensers in the Globe-Union T-132 amplifier. (Report No. OD-3-255.) F. W. Jirauch. NBS, Ordnance Development Division. June 4, 1945.
- 238 Circuits and Related Components**
- 238.1 MC-380 Circuits**
(See also: 238.41)
- M1** Shift in the frequency transmission of the MC-380 circuit resulting from variations of screen grid shunt or the output coupling condenser capacitances. Seymour Golden. [NBS, Ordnance Development Division.] April 15, 1943.
- M2** Revision of the MC-380 circuit. (Report No. OD-2-2.) J. G. Hoffman, Ralph Stair and Alexander Orden. NBS, Ordnance Development Division. October 1, 1943.
- 238.2 Amplifiers**
- 238.21 Amplifier Construction and Design**
- 238.211 Gain Control**
- M1** Gain control for amplifiers. Robert D. Huntoon and F. Lamar Cooke. NBS, Ordnance Development Division. August 23, 1943.
- M2** Measurement of amplifier gain of balancing equipment. A. Donald Arsem. [NBS, Ordnance Development Division.] July 10, 1944.
- M3** Universal high-gain amplifier. (Report No. OD-3-186.) George Nordquist. NBS, Ordnance Development Division. October 20, 1944.
- M4** Experimental production of high-gain modified White amplifiers. (Report No. OD-3-194.) Philip R. Karr. NBS, Ordnance Development Division. November 8, 1944.
- M5** The effect of tube parameters on the available gain of amplifiers. (Report No. OD-3-231.) Chris Gregory. NBS, Ordnance Development Division. March 17, 1945.
- M6** Comparison of the wire-wound and ceramic gain controls for use in the 10-E amplifier. (Preliminary Report No. OD-3-236P.) F. W. Jirauch and Donald G. Green. NBS, Ordnance Development Division. April 7, 1945.
- 238.212 Amplifier Shaping and After-Burning**
- M1** Amplifier shaping and after-burning pulses. Bertrand J. Miller. [NBS, Ordnance Development Division.] March 4, 1943.
- M2** After-burning and amplifier shaping. Robert D. Huntoon. [NBS, Ordnance Development Division.] March 5, 1943.
- M3** A study of the relation between after-burning and thyatron voltage. (Memorandum No. 158-T.) R. Vorkink. Service Project No. OD-27. NBS, Ordnance Development Division. April 14, 1943.

- M4** Response of shaped amplifiers to step pulses and sharp pulses. (Report No. OD-3-253.) Philip R. Karr, R. B. Schwartz and Mary L. Scott. NBS, Ordnance Development Division. May 31, 1945.

238.213 Miscellaneous Amplifier Problems

- M1** New amplifier design, plane-to-plane application. (Report No. OD-3-38.) Robert D. Huntoon. [NBS, Ordnance Development Division.] November 29, 1943.
- M2** Amplifier hum suppression. (Report No. OD-3-158.) Robert D. Huntoon and Philip R. Karr. NBS, Ordnance Development Division. June 9, 1944.
- M3** A study of some amplifier curves for use with the M-43C mortar. (Report No. OD-3-267P.) Mary L. Scott and George Nordquist. NBS, Ordnance Development Division. July 4, 1945.
- M4** Effect of key components on amplifier response characteristics. (Report No. OD-3-275.) George Nordquist. NBS, Ordnance Development Division. July 16, 1945.

238.22 Amplifier Types

238.221 MC-380

- M1** Change in wiring of the MC-380-A head. (Case No. 23236.) J. M. West. [Bell Telephone Laboratories, Inc.] October 26, 1942.
- M2** Pulse and frequency characteristics of MC-380 amplifiers. Seth H. Neddermeyer. [NBS, Ordnance Development Division.] March 31, 1943.
- M3** Frequency characteristics of variations of MC-380 amplifier. (Report No. OD-2-1.) Ralph Stair, Seymour Golden and Paul Miller. NBS, Ordnance Development Division. June 8, 1943.
- M4** Sun transients in [the] MC-380 amplifier circuit. R. F. Morrison, Jr., Glenn L. Scillian and J. G. Hoffman. [NBS, Ordnance Development Division.] [September 10, 1943.]

238.222 MC-382

- M1** Analysis of feed-back amplifier for MC-382 fuze. (Progress Report No. A-122.) Robert D. Huntoon, William L. Kraushaar and Herbert D. Cook. NBS, Ordnance Development Division. December 7, 1942.
- M2** Preliminary discussion [of] amplifier simplification for MC-382 fuze. (Memorandum No. 35-R.) R. H. Pintell. Service Project No. OD-27. Emerson Radio and Phonograph Corporation. April 8, 1943.
- M3** Amplifier simplification for MC-382 fuze. (Parts I and II. Memorandum No. 48-R.) R. H. Pintell. Service Project No. OD-27. Emerson Radio and Phonograph Corporation. May 24 and July 24, 1943.
- M4** Preliminary information on audio amplifier, BRLG-10. Robert D. Huntoon and F. Lamar Cooke. NBS, Ordnance Development Division. September 18, 1943.

- M5** Shelf-life test on MC-382 units. (Report No. OD-5-522.) Paul J. Martin. NBS, Ordnance Development Division. October 12, 1944.

238.223 10-E

- M1** [The] 10-E amplifier. (Report No. OD-3-170.) Philip R. Karr and Chester H. Page. NBS, Ordnance Development Division. July 21, 1944.
- M2** Effect of amplifier shape on function height of T-50 E-10. (Report No. OD-3-172.) Philip R. Karr. NBS, Ordnance Development Division. August 11, 1944.
- M3** Delay of 10-E amplifier. (Report No. OD-BE-41R.) R. B. Schwartz. NBS, Ordnance Development Division. September 25, 1944.
- M4** Tube and component study of 10-E amplifier. (Report No. OD-3-190.) Chris Gregory. NBS, Ordnance Development Division. October 30, 1944.
- M5** Alteration of feed-back components in the basic 10-E circuit, to provide shaped amplifiers having peak frequencies at 60, 70, 80, 90 and 100 cycles per second. (Report No. OD-3-200.) George Nordquist. NBS, Ordnance Development Division. November 18, 1944.

238.224 11-A

- M1** BRLG-11A amplifier for Zell manufacture. (Report No. OD-3-24.) Robert D. Huntoon. [NBS, Ordnance Development Division.] November 8, 1943.
- M2** Component specifications for BRLG-11A. (Report No. OD-3-39.) Robert D. Huntoon. NBS, Ordnance Development Division. December 2, 1943.
- M3** Design curves for BRLG-11A. (Report No. OD-3-40.) F. Lamar Cooke and Robert D. Huntoon. NBS, Ordnance Development Division. December 3, 1943.
- M4** Effect of component tolerances on performance of BRLG-11A. (Report No. OD-3-46.) Robert D. Huntoon. NBS, Ordnance Development Division. December 7, 1943.
- M5** Performance of Zell 11-A amplifiers on standard test voltages. (Report No. OD-3-63.) Robert D. Huntoon. [NBS, Ordnance Development Division.] December 23, 1943.
- M6** Linearity of 11-A amplifier. (Report No. OD-3-148.) George Nordquist. NBS, Ordnance Development Division. May 13, 1944.
- M7** Behavior of 11-A amplifier at 5,000 cps. (Report No. OD-3-156.) Philip R. Karr and George Nordquist. NBS, Ordnance Development Division. May 25, 1944.
- M8** Effect of low temperatures and high voltages on performance of 11-A amplifiers. (Report No. OD-3-169.) Philip R. Karr and Milton Weiss. NBS, Ordnance Development Division. July 19, 1944.

238.225 T-Types

- M1** Amplifier characteristics for T-6 application. (Re-

port No. OD-3-107.) Charles J. Apolenis and Robert D. Huntoon. NBS, Ordnance Development Division. March 7, 1944.

- M2** The BRTG-T-1B amplifier. (Report No. OD-3-204.) Ralph Stair and Glenn L. Scillian. NBS, Ordnance Development Division. December 7, 1944.
- M3** Proposed amplifier for T-30. (Report No. OD-3-205.) Philip R. Karr. NBS, Ordnance Development Division. December 12, 1944.
- M4** Modification of T-30 amplifier. (Memorandum No. OD-3-88M.) George Nordquist. [NBS, Ordnance Development Division.] March 2, 1945.
- M5** Revised circuit for BRTG-T-1B amplifier. (Report No. OD-3-219.) Dorothy R. Adams and George Nordquist. NBS, Ordnance Development Division. March 2, 1945.
- M6** Suggested T-132L amplifier having low gain at low frequency. (Report No. OD-3-225.) George Nordquist. NBS, Ordnance Development Division. March 12, 1945.
- M7** Revised amplifier for T-91. (Report No. OD-5-765.) Paul E. Landis and George Nordquist. NBS, Ordnance Development Division. March 29, 1945.
- M8** Temperature effect on the Globe-Union T-132 amplifier and amplifier components. (Preliminary Report No. OD-3-252P.) F. W. Jirauch and Donald G. Green. NBS, Ordnance Development Division. May 28, 1945.
- M9** Revised T-2005 amplifier. (Report No. OD-3-264.) Dorothy R. Adams. NBS, Ordnance Development Division. July 30, 1945.
- M10** Revision of Westinghouse T-82 units. (Memorandum No. OD-3-122M.) Ralph Stair, George Nordquist and Dorothy R. Adams. [NBS, Ordnance Development Division.] August 3, 1945.

238.226 P-Types

- M1** [The] BRTG-P4B audio amplifier. (Report No. OD-2-33.) Ralph Stair and Thomas M. Marion. NBS, Ordnance Development Division. May 13, 1944.
- M2** [The] BRTG-P4C amplifier. (Report No. OD-2-38.) Ralph Stair and Thomas M. Marion. NBS, Ordnance Development Division. June 7, 1944.
- M3** Component tolerance study on the BRTG-P5 amplifier. (Report No. OD-3-180.) Chris Gregory and Ralph Stair. NBS, Ordnance Development Division. September 22, 1944.

238.227 Miscellaneous Amplifier Types

- M1** A two-stage feedback amplifier. (Report No. OD-2-6.) Ralph Stair, Thomas M. Marion and E. Eisner. NBS, Ordnance Development Division. November 24, 1943.
- M2** [The] BRLG-10A. (Report No. OD-3-94.) F. Lamar Cooke. NBS, Ordnance Development Division. February 3, 1944.
- M3** Pentode acceptance amplifier. (Report No. OD-

BE-1M.) Robert D. Huntoon. [NBS, Ordnance Development Division.] June 19, 1944.

- M4** The 11-N-2 medium-band amplifier. (Report No. OD-3-208.) George Nordquist. NBS, Ordnance Development Division. January 8, 1945.

238.3 Oscillators

- M1** Report of Radio Group for week ending April 18, 1942. Harry M. Diamond. [NBS, Ordnance Development Division.] April 20, 1942.
- M2** Comparison of radiated power of oscillator-diode and reaction grid detection oscillators. (Report No. OD-BE-7R.) R. F. Morrison, Jr. NBS, Ordnance Development Division. July 17, 1944.
- M3** Comparison of oscillator-diode and reaction grid detection circuits. (Report No. OD-BE-13R.) R. B. Schwartz. NBS, Ordnance Development Division. July 29, 1944.
- M4** Jolt tests of T-171 bases. (Memorandum No. OD-4-52M.) Louis Schuman. [NBS, Ordnance Development Division.] May 7, 1945.

238.31 Oscillator-Diode Type

- M1** Microphonic stability of oscillator-diode type of fuze circuit. (Report No. OD-3-117.) Robert D. Huntoon. NBS, Ordnance Development Division. March 22, 1944.
- M2** Sensitivity of BRTG power oscillating detector. (Report No. OD-3-199.) Glenn L. Scillian and Chester H. Page. NBS, Ordnance Development Division. November 17, 1944.

238.32 Reaction Grid Detection Type

- M1** Experiments with standard MC-382 fuzes converted to reaction-type fuzes with grid detection, RGD fuze. (Report No. OD-3-27.) Philip Krupen and W. S. Hinman, Jr. NBS, Ordnance Development Division. November 15, 1943.
- M2** Status of work on reaction grid detection. (Report No. OD-3-47.) Bertrand J. Miller. NBS, Ordnance Development Division. December 7, 1943.
- M3** Experiments with the reaction grid detection circuit applied to BRLG-8. (Report No. OD-3-48.) William L. Kraushaar. NBS, Ordnance Development Division. December 9, 1943.
- M4** A reaction grid detection circuit for the MC-382. (Report No. OD-3-79.) Philip Krupen. NBS, Ordnance Development Division. January 15, 1944.
- M5** Reaction grid detection circuit for BRLG applications. (Report No. OD-3-102.) Philip Krupen. NBS, Ordnance Development Division. February 24, 1944.
- M6** Testing of reaction grid detection units. (Report No. OD-3-131.) Philip Krupen. NBS, Ordnance Development Division. April 22, 1944.
- M7** Reaction grid detection field simulator. (Report No. OD-3-163.) Philip Krupen. NBS, Ordnance Development Division. June 17, 1944.
- M8** Amplifier with hum-bucking feature for White

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reaction grid detection. (Memorandum No. OD-3-28M.) Philip R. Karr. [NBS, Ordnance Development Division.] August 8, 1944.

M9 Voltage relationships in the reaction grid detection oscillator. (Report No. OD-BE-30R.) R. F. Morrison, Jr. NBS, Ordnance Development Division. August 23, 1944.

M10 Effect of low plate supply voltage on RGD-PB units. (Report No. OD-3-184.) Philip Krupen and Leonard C. Pochop. NBS, Ordnance Development Division. October 6, 1944.

M11 A reaction grid detection oscillator for working into high radiation resistances. (Report No. OD-3-212.) Richard F. Mills. NBS, Ordnance Development Division. January 24, 1945.

M12 A simplified RGD-PB oscillator. (Report No. OD-3-216.) Paul Miller. NBS, Ordnance Development Division. February 7, 1945.

M13 The reaction grid detection oscillator. (Report No. OD-3-227.) Philip Krupen. NBS, Ordnance Development Division. March 14, 1945.

M14 A quasi-Hartley plate-loaded reaction grid detection oscillator. (Report No. OD-3-232.) Paul Miller and Richard F. Mills. NBS, Ordnance Development Division. March 20, 1945.

238.33 Oscillator Tests

M1 Master indices for oscillator pre-test, audio pre-test, and pre- and post-pot test, Universal reaction grid detection. (NBS Drawing Nos. L-5515, L-5516 and L-5524.) (n.a.) NBS, Ordnance Development Division. July 16 and September 23, 1946.

238.4 Photocell Circuits

M1 The use of higher sensitivity photocells in the MC-380 unit. J. G. Hoffman and R. F. Morrison, Jr. [NBS, Ordnance Development Division.] April 19, 1943.

238.41 Photocell Resistor

(See also: 238.1)

M1 Photocell-varistor combinations. Robert Hofstadter and R. F. Morrison, Jr. [NBS, Ordnance Development Division.] September 9, 1942.

M2 Preliminary proposal for a system of matching non-linear load resistor to photocell. (Memorandum No. 25-P.) J. G. Hoffman and R. F. Morrison, Jr. Service Project No. OD-27. NBS, Ordnance Development Division. April 20, 1943.

M3 Proposed method of matching non-linear load resistors to photocells. (Memorandum No. 27-P.) J. G. Hoffman and R. F. Morrison, Jr. Service Project No. OD-27. NBS, Ordnance Development Division. May 4, 1943.

M4 Matching photocells and non-linear load resistors in the MC-380 circuit. (Memorandum No. 32-P.) J. G. Hoffman and R. F. Morrison, Jr. Service Project No. OD-27. NBS, Ordnance Development Division. June 8, 1943.

M5 Impedance of the MC-380 input circuit as a function of photocell sensitivity. (Report No. OD-2-16.) J. G. Hoffman and R. F. Morrison, Jr. NBS, Ordnance Development Division. August 12, 1943.

238.42 Zero-Stage Units

M1 Regarding zero-stage units. Robert Hofstadter. [NBS, Ordnance Development Division.] August 1, 1942.

M2 Zero-stage units. (Report No. 14-P.) Robert Hofstadter and R. F. Morrison, Jr. Service Project No. OD-27. NBS, Ordnance Development Division. February 18, 1943.

238.43 Double-Input

M1 Double-input circuits. John F. Streib. [NBS, Ordnance Development Division.] November 11, 1942.

M2 The balanced double-input circuit. John F. Streib. [NBS, Ordnance Development Division.] April 1, 1943.

M3 Additional remarks on series double-input circuit. John F. Streib. [NBS, Ordnance Development Division.] April 5, 1943.

238.44 Photocell Tests

M1 Description of photocell testing apparatus and procedure. John F. Streib. [NBS, Ordnance Development Division.] March 26, 1942.

M2 Suggested procedure for measuring photocell current in testing sensitivity of the optical-photocell system of photoelectric fuze without disassembling. John F. Streib. [NBS, Ordnance Development Division.] September 26, 1942.

M3 A rectified alternating current method of measuring photocell characteristics, and tests of some Westinghouse lenses. Fred L. Mohler. [NBS, Ordnance Development Division.] October 12, 1942.

M4 Photocell inspection. John F. Streib. [NBS, Ordnance Development Division.] October 22, 1942.

238.5 Arming and Firing Circuits

238.51 Arming

(See also: 244)

238.511 Switches

M1 Setback switches. William B. McLean, Jacob Rabinow and L. M. Andrews. NBS, Ordnance Development Division. March 9, 1942.

M2 Specifications for a powder train interrupter and electric switch for fuzes for 4½-inch projectile. William B. McLean. [NBS, Ordnance Development Division.] August 31, 1942.

M3 Direction of rotation of escapement wheel in setback arming devices. William B. McLean. [NBS, Ordnance Development Division.] October 10, 1942.

M4 [The] SW-200 switch, modified to fire on contact.

(Report No. OD-4-44.) Jacob Rabinow. NBS, Ordnance Development Division. March 31, 1944.

M5 Field test of SW-200 0.7-sec switches. Photographic method for timing early functions in high-angle firing, March 30, 1944. (Report No. OD-1-237.) D. W. Scott. NBS, Ordnance Development Division. April 20, 1944.

M6 Effect of rotation upon the operation of the SW-230 switch. (Report No. OD-1-729.) Charles C. Gordon. NBS, Ordnance Development Division. April 30, 1945.

238.512 Gear Reduction Units

M1 Noise produced by gear trains using various types of gears. (Report No. OD-4-3.) F. S. Manov. NBS, Ordnance Development Division. October 2, 1943.

M2 Eliminating noise due to T-50 gear trains. (Memorandum No. OD-4-21M.) Jacob Rabinow. [NBS, Ordnance Development Division.] February 7, 1945.

M3 Development and manufacturing report on NDRC gear reduction unit for VT bomb fuze. (n.a.) OEMsr-1117. Globe-Union, Inc. August 31, 1945.

M4 Development and manufacturing report on NDRC gear reduction unit for VT rocket fuze. (n.a.) OEMsr-1117. Globe-Union, Inc. September 14, 1945.

238.513 Arming Pin

M1 Force required to pull out arming wire on BRLG unit. (Report No. OD-4-72.) Samuel Kolodny. NBS, Ordnance Development Division. June 13, 1944.

M2 Improvements in the arming system for the T-50 fuze. (Report No. OD-4-79.) Jacob Rabinow. NBS, Ordnance Development Division. August 23, 1944.

M3 Arming pin considerations for the T-132. (Memorandum No. OD-4-44M.) Jacob Rabinow. [NBS, Ordnance Development Division.] April 7, 1945.

M4 Second test of double-element setback pins. (Report No. OD-4-128.) George T. Parish. NBS, Ordnance Development Division. September 5, 1945.

238.514 Resistance-Capacitance Arming Delay

M1 Effect of condenser leakage on resistance-capacitance arming. (Report No. OD-126.) Cleo Brunetti. NBS, Ordnance Development Division. September 23, 1943.

M2 Incorporation of resistance-capacitance arming for T-30. (Memorandum No. OD-3-48M.) William L. Kraushaar. [NBS, Ordnance Development Division.] October 20, 1944.

M3 Probability distribution of arming time using resistance-capacitance arming. (Report No. OD-BE-49R.) Charles Ravitsky. NBS, Ordnance Development Division. October 23, 1944.

M4 Apex performance of the T-171 mortar fuze with

resistance-capacitance arming delay. (Report No. OD-3-242.) Philip Krupen. NBS, Ordnance Development Division. May 5, 1945.

M5 Grid bias circuit for T-171 mortar fuze to reduce apex malfunction. (Report No. OD-3-256.) Dorothy R. Adams and George Nordquist. NBS, Ordnance Development Division. June 5, 1945.

238.515 Miscellaneous Arming Mechanisms

M1 Arming considerations in T-6. (Report No. OD-3-74.) Bertrand J. Miller and Philip R. Karr. NBS, Ordnance Development Division. January 22, 1944.

M2 Minimum useful range for T-6. (Report No. OD-3-98.) Robert D. Huntoon. NBS, Ordnance Development Division. February 9, 1944.

M3 MRLG gear design. Jacob Rabinow. [NBS, Ordnance Development Division.] May 22, 1944.

M4 Some comments of field personnel on experience with bombs and fuzes. (Memorandum No. OD-4-19M.) Jacob Rabinow. [NBS, Ordnance Development Division.] January 25, 1945.

M5 Requirements for "doughnut" mechanism. (Memorandum No. OD-4-39M.) Jacob Rabinow and J. A. Senn. [NBS, Ordnance Development Division.] March 17, 1945.

M6 Arming pulse protection circuit. (Report No. OD-3-284.) Philip R. Karr, William L. Kraushaar and Chester H. Page. NBS, Ordnance Development Division. September 14, 1945.

238.52 Detonators

238.521 BS-4 Squibs

M1 Specification tests on BS-4 squibs. (Memorandum No. PG-380.) W. A. Yates. [NBS, Ordnance Development Division.] November 6, 1942.

M2 Reliability of firing of BS-4 squibs, and time tests with radio frequency choke and with resistance in series with squib. (Memorandum No. PG-383.) Allen V. Astin and W. A. Yates. [NBS, Ordnance Development Division.] November 9, 1942.

M3 Test on minimum firing current of BS-4 squib. (Memorandum No. PG-395.) W. A. Yates. [NBS, Ordnance Development Division.] November 18, 1942.

M4 Time lag specification for BS-4 squibs. (Memorandum No. 29-T.) Allen V. Astin and W. A. Yates. Service Project No. OD-27. NBS, Ordnance Development Division. January 29, 1943.

M5 Request for laboratory test on performance of BS-4 squibs. Cleo Brunetti. [NBS, Ordnance Development Division.] October 18, 1943.

M6 BS-4 detonators fired through Sylvania SA-782-B thyratrons. Summary report on recent tests, October and November, 1943. (Report No. OD-1-82.) T. N. White and L. C. Miller. NBS, Ordnance Development Division. December 21, 1943.

M7 Minimum voltage to fire BS-4 detonators through

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- thyratrons in complete MC-382 heads. Theodore B. Godfrey. [NBS, Ordnance Development Division.] December 30, 1943.
- M8** Time lags in BS-4 detonators when fired without firing condensers. October, 1943 [tests]. (Report No. OD-1-154.) L. C. Miller. NBS, Ordnance Development Division. February 15, 1944.
- M9** Analysis of the BS-4 detonator. (Report No. OD-2-BE-73R.) Charles Ravitsky. NBS, Ordnance Development Division. March 7, 1945.
- 238.522 BS-5 Squibs**
- M1** Tests on reliability of firing, minimum reliable firing voltage and time lags for BS-5 squibs. (Memorandum No. PG-319.) W. A. Yates. [NBS, Ordnance Development Division.] September 30, 1942.
- M2** Detonator firing test. W. A. Yates. [NBS, Ordnance Development Division.] November 3, 1944.
- M3** BS-5 detonators fired with 1.5-microfarad condenser. (Report No. OD-1-699.) Charles C. Gordon. NBS, Ordnance Development Division. April 2, 1945.
- 238.523 Miscellaneous Detonators**
- M1** Leakage resistance of BS-4 and BS-5 detonators. (Report No. OD-1-75.) W. A. Yates. NBS, Ordnance Development Division. December 4, 1943.
- M2** Firing circuit curves. Theodore B. Godfrey. [NBS, Ordnance Development Division.] July 26, 1944.
- M3** Design of impact detonating element for the T-32 fuze. (Report No. OD-4-96.) Louis Schuman. NBS, Ordnance Development Division. February 17, 1945.
- M4** The detonator circuit. (Report No. OD-BE-74R.) Charles Ravitsky. NBS, Ordnance Development Division. March 7, 1945.
- M5** Method of assembling detonators to the T-132/T-171 interruptor rotors. (Report No. OD-4-124.) Jacob Rabinow. NBS, Ordnance Development Division. August 3, 1945.
- 238.6 U-Blocks**
- M1** Investigation of U-block vibration. (Memorandum No. MA-1-2-45.) A. H. Youmans. OEMsr-769. State University of Iowa. January 20, 1945.
- M2** Supplementary data on U-block vibration. (Memorandum No. MA-2-2-45.) A. H. Youmans and George S. Carson. OEMsr-769. State University of Iowa. February 24, 1945.
- 238.7 Miscellaneous Circuits**
- M1** Report on visit to Emerson Company [regarding audio circuits]. Philip Krupen. [NBS, Ordnance Development Division.] April 22, 1943.
- M2** Study of Pintell circuit. Philip Krupen and F. Lamar Cooke. [NBS, Ordnance Development Division.] April 30, 1943.
- 239 Miscellaneous Fuze Components**
- 239.1 Potting Materials**
- M1** Use of polymerized tung oil for potting MC-380 and MC-382 fuzes. [Cledo Brunetti and Philip J. Franklin.] [NBS, Ordnance Development Division.] April 29, 1943.
- M2** Potential substitutes for tung oil and ceresin wax. (Report No. OD-5-42.) Philip J. Franklin. NBS, Ordnance Development Division. July 19, 1943.
- M3** Dielectric constant and power factor loss of some potting materials. (Report No. OD-5-75.) Philip J. Franklin. NBS, Ordnance Development Division. August 3, 1943.
- M4** Amplifier performance of BRLG-8 potted with Glidden compound. (Report No. OD-3-26.) Albert Weiss. NBS, Ordnance Development Division. November 8, 1943.
- M5** Effect of potting upon amplifier shaping. (Report No. OD-3-175.) Philip R. Karr and George Nordquist. NBS, Ordnance Development Division. August 17, 1944.
- 239.2 Lock Washers**
- M1** Lock washers. (Memorandum No. OD-4-12M.) Jacob Rabinow. [NBS, Ordnance Development Division.] January 12, 1945.
- 239.3 Dielectrics**
- M1** A study of the dielectric properties of dielectric materials made from mixtures of titanium alloys. (Report No. WRL-UF-9.) D. C. Swanson, W. H. Beisler and R. D. Walker. University of Florida. September 2, 1945.
- 240 Miscellaneous Factors Concerning Fuze Performance**
- 241 Function, Burst Height**
- M1** Evaluations of ground-approach functions [of] PEP and RRP fuzes. [Tests at] Fort Bragg, April 14 and 15, 1943. (Memorandum No. 180-T.) J. L. Thomas, R. R. Vorkink and T. N. White. Service Project No. OD-27. NBS, Ordnance Development Division. April 23, 1943.
- M2** Computation of heights of function, including induction and quasi-static field effects. (Report No. OD-3-89.) Bertrand J. Miller and Philip R. Karr. NBS, Ordnance Development Division. January 29, 1944.
- M3** Prediction of heights of function. (Report No. OD-BE-22R. Supplement to Report No. OD-3-89.) Bertrand J. Miller and M. Schulkin. NBS, Ordnance Development Division. August 11, 1944.
- M4** Electrical design considerations for T-30. (Report No. OD-3-203.) William E. Kraushaar, Bertrand J. Miller and R. B. Schwartz. NBS, Ordnance Development Division. December 5, 1944.
- M5** T-50 function height for various amplifiers under manifold release conditions. (Report No. OD-3-215.) Mary L. Scott. NBS, Ordnance Development Division. February 2, 1945.

- M6** Heights of function with proposed universal amplifier for mortar application. (Preliminary Report No. OD-3-235P and addendum.) Philip R. Karr, Mary L. Scott and George Nordquist. NBS, Ordnance Development Division. April 4 and 16, 1945.
- M7** Transparent charts for prediction of function height. (Report No. OD-3-257.) Philip R. Karr, Chris Gregory and others. NBS, Ordnance Development Division. June 6, 1945.
- M8** Computation of burst heights of longitudinally-excited bomb fuzes. (Report No. OD-3-281.) R. B. Schwartz. NBS, Ordnance Development Division. August 7, 1945.
- M9** Prediction of T-51 burst height. (Technical Memorandum No. OD-1-TM-11.) D. A. Worcester. NBS, Ordnance Development Division. November 8, 1945.
- M10** Relation between the spread in burst heights and the mean burst height of VT bomb fuzes. (Technical Memorandum No. OD-1-TM-13.) R. C. Stillinger. NBS, Ordnance Development Division. December 13, 1945.
- M11** Empirical burst height distribution formulae for VT bomb fuzes. (Technical Memorandum No. OD-1-23M.) R. C. Stillinger and Irene Hess. NBS, Ordnance Development Division. September 17, 1946.
- M12** A comparison of observed and predicted burst heights of ring-type VT bomb fuzes. (Technical Memorandum No. OD-1-24M.) W. J. Cronin, T. N. White and others. NBS, Ordnance Development Division. September 19, 1946.

241.1 Radius of Action

- M1** Expected radius of action for T-30. (Report No. OD-BE-53R.) Bertrand J. Miller and Franklin M. Fletcher. NBS, Ordnance Development Division. November 3, 1944.
- M2** Computation of expected radius of action. (Memorandum No. OD-3-53M.) Chester H. Page. [NBS, Ordnance Development Division.] November 6, 1944.
- M3** Estimates of radius of action of T-30 from steady-state computations. (Report No. OD-BE-56R.) R. F. Morrison, Jr., Thomas M. Marion and Franklin M. Fletcher. NBS, Ordnance Development Division. December 4, 1944.

242 Properties of Missiles

242.1 Bombs

242.11 Controlled-Trajectory Bombs

- M1** The aerodynamics of controlled-trajectory bombs. (Progress Report No. A-32.) Hugh L. Dryden. Service Project No. AC-36. NBS, Ordnance Development Division. February 23, 1942.
- M2** Controlled-trajectory bombs, as of March 1, 1942. (Progress Report No. A-37.) Hugh L. Dryden.

Service Project No. AC-36. NBS, Ordnance Development Division. March 17, 1942.

- M3** The state of development of maneuverable controlled-trajectory bombs [as of] September 1, 1942. (Progress Report No. A-109.) Hugh L. Dryden. Service Project Nos. AC-36, NO-40 and NO-115. NBS, Ordnance Development Division. November 6, 1942.

242.12 Air-Burst Bombs

- M1** Evaluation of air-burst bombs for clearance of mine fields. (Report No. A-291.) Robert D. Huntoon. Service Project No. OD-27; OSRD No. 4100. NBS, Ordnance Development Division. August, 1944.
- M2** Air-burst bombs. (Division 2.) A. H. Taub. December 21, 1944.
- M3** Evaluation of air-burst bombs for clearance of mine fields. (Final Report No. OD-1-599.) E. F. Horton, Jr. NBS, Ordnance Development Division. December 23, 1944.
- M4** Air burst for blast bombs. (Division 2. Report No. A-322.) E. Bright Wilson, Jr., W. D. Kennedy and others. OEMsr-260 and OEMsr-569; Service Project Nos. OD-03, NO-224 and others; OSRD No. 4943. Princeton University, Woods Hole Oceanographic Institution and others. April, 1945.

242.13 Miscellaneous Types of Bombs

- M1** Puff delay [in] 500-lb bomb. (Report No. OD-1-41.) Theodore B. Godfrey. NBS, Ordnance Development Division. November 5, 1943.
- M2** Fire bombs tried at Eglin Field with VT fuzes. (Report No. OD-2-255M.) T. N. White. [NBS, Ordnance Development Division.] July 13, 1945.

242.14 Miscellaneous Bomb Problems

- M1** Impact angles and striking velocities for dive bombing. (Report No. OD-7-88R.) F. L. Celauro. [NBS, Ordnance Development Division.] March 22, 1945.
- M2** Table of bomb velocity vs. air travel. (Report No. OD-2-252M.) Allen T. Foster. NBS, Ordnance Development Division. July 5, 1945.
- M3** Tables of mean point of impact settings required for different bomb ballistic coefficients. (Memorandum No. OD-SP-123M.) C. F. Eve. [NBS, Ordnance Development Division.] July 20, 1945.
- M4** Vertical component of striking velocity vs. altitude [for] various bombs [at] 200-mph release. (Report No. OD-OAG-20.) (n.a.) (n.d.)

243 Radiation

243.1 Radiation Patterns

243.11 Bombs

- M1** Radiation properties of BRLG. (Memorandum

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No. 43-R.) Robert D. Huntoon. Service Project No. OD-27. NBS, Ordnance Development Division. July 28, 1943.

- M2** Selection of optimum frequencies for BRLG vehicles. (Memorandum No. 52-R.) Robert D. Huntoon. Service Project No. OD-27. NBS, Ordnance Development Division. Revised: April 17, 1944.

- M3** Radiation patterns on Zenith and Westinghouse BRTG. (Memorandum No. OD-3-34M.) Ralph Stair. [NBS, Ordnance Development Division.] August 25, 1944.

- M4** Electrical properties of British 4000-lb bomb. (Memorandum No. OD-BE-42M.) Harry M. Diamond. [NBS, Ordnance Development Division.] August 26, 1944.

- M5** Radiation patterns and electrical balance of BRTG. (Report No. OD-3-177.) Glenn L. Scillian and Ralph Stair. NBS, Ordnance Development Division. August 31, 1944.

- M6** Radiation properties of British 4000-lb bomb. (Memorandum No. OD-BE-47M.) Franklin M. Fletcher and Otto E. Spokas. [NBS, Ordnance Development Division.] September 9, 1944.

- M7** Radiation properties of depth bombs. (Memorandum No. OD-BE-53M.) Otto E. Spokas and Franklin M. Fletcher. [NBS, Ordnance Development Division.] September 15, 1944.

- M8** Additional measurements on radiation properties of British 4000-lb bomb. (Memorandum No. OD-BE-56M.) Otto E. Spokas and Franklin M. Fletcher. [NBS, Ordnance Development Division.] September 19, 1944.

- M9** Radiation properties of 1,000- and 2000-lb general-purpose bombs. (Memorandum No. OD-BE-59M.) Franklin M. Fletcher and Otto E. Spokas. [NBS, Ordnance Development Division.] September 27, 1944.

- M10** Radiation properties of vehicles M-30, M-64 and M-81. (Memorandum No. OD-BE-66M.) Franklin M. Fletcher and Otto E. Spokas. [NBS, Ordnance Development Division.] October 5, 1944.

- M11** Low-frequency operation of bomb fuzes. (Report No. OD-3-258.) R. B. Schwartz. NBS, Ordnance Development Division. June 7, 1945.

243.12 Rockets

- M1** Radiation dummy load considerations for MC-382. (Memorandum No. 33-R.) R. H. Pintell. Service Project No. OD-27. Emerson Radio and Phonograph Corporation. March 2, 1943.

- M2** Radiation patterns of the AR and H-4.5 rockets. (Memorandum No. OD-7-212M.) Otto E. Spokas. [NBS, Ordnance Development Division.] July 21, 1945.

243.13 Mortars

- M1** Radiation properties of the M-43 and M-56. (Memorandum No. OD-BE-54M.) Franklin M. Fletcher and Otto E. Spokas. [NBS, Ordnance Development Division.] September 18, 1944.

- M2** Radiation properties of the 5-inch mattress and the 155-mm mortar projectile. (Memorandum No. OD-BE-63M.) Otto E. Spokas and Franklin M. Fletcher. [NBS, Ordnance Development Division.] September 30, 1944.

243.2 Radiation Resistance

243.21 Bombs

- M1** Effect of ground reflection on BRLG performance. (Report No. OD-3-19.) Charles J. Apolenis and Robert D. Huntoon. NBS, Ordnance Development Division. November 2, 1943.

- M2** Theoretical estimates of the radiation resistance of the BRTG propeller antenna model. (Report No. OD-2-30.) J. G. Hoffman and David Feldman. NBS, Ordnance Development Division. April 24, 1944.

- M3** Radiation resistance of BRLG vehicles. (Memorandum No. OD-BE-2M.) Robert D. Huntoon. [NBS, Ordnance Development Division.] June 20, 1944.

- M4** Radiation resistance of Zenith BRTG-Z units. (Report No. OD-3-178.) Glenn L. Scillian and Ralph Stair. NBS, Ordnance Development Division. September 13, 1944.

243.22 Rockets

- M1** Radiation resistance of [the M-9] rocket. (Report No. OD-3-105.) Otto E. Spokas, Charles C. Gordon and Robert D. Huntoon. NBS, Ordnance Development Division. March 2, 1944.

- M2** Radiation properties of the HVAR 5-inch rocket. (Memorandum No. OD-BE-50M.) Otto E. Spokas and R. F. Morrison, Jr. [NBS, Ordnance Development Division.] September 13, 1944.

- M3** Radiation properties of various rockets. (Memorandum No. OD-BE-92M.) Bertrand J. Miller. [NBS, Ordnance Development Division.] December 12, 1944.

- M4** Additional radiation resistance data on the HVAR, AR-3.5 and AR-5 rockets. (Memorandum No. OD-7-202M.) Otto E. Spokas. [NBS, Ordnance Development Division.] May 1, 1945.

- M5** Radiation resistance presented to the Type T-2005 unit. (Memorandum No. OD-7-205M.) Otto E. Spokas. [NBS, Ordnance Development Division.] June 25, 1945.

243.23 Mortars

- M1** Radiation resistance of the M-56 mortar, the M-43 mortar with an M-56 tail, the AN-M-41 fragmentation bomb and the 155-mm chemical mortar projectile when used with a MRLG-type unit. (Memorandum No. OD-BE-98M.) Otto E. Spokas. [NBS, Ordnance Development Division.] December 19, 1944.

- M2** The effect of various antenna rings on the radiation resistance of the M-56 mortar and the M-43 mortar with the M-56 tail. (Memorandum No.

OD-BE-127M.) Otto E. Spokas. [NBS, Ordnance Development Division.] April 2, 1945.

- M3** Radiation resistance of the M-56 mortar shell with 2-inch tail extension. (Memorandum No. OD-7-213M.) Otto E. Spokas. [NBS, Ordnance Development Division.] August 28, 1945.

243.3 Gas Tanks

- M1** Radiation properties of gas tanks. (Preliminary Memorandum No. OD-BE-89M.) Bertrand J. Miller. [NBS, Ordnance Development Division.] November 27, 1944.

243.4 Vehicle Radiation

- M1** A possible method of reducing the undesired parasitic radiation from a vehicle excited transversely. C. Albert Moreno. University of Florida. November 1, 1943.
- M2** Pole tests on various vehicles at Blossom Point. (Report No. OD-3-174.) James H. Barnard, Glenn L. Scillian and Ralph Stair. NBS, Ordnance Development Division. August 16, 1944.
- M3** Pole tests on British two-ton vehicle. (Memorandum No. OD-3-33M.) Ralph Stair and James H. Barnard. [NBS, Ordnance Development Division.] August 24, 1944.

244 Arming

(See also: 238.51)

244.1 Air Travel-to-Arming

- M1** Air travel required for release of arming cover. (Report No. OD-4-54.) E. U. Rotor. NBS, Ordnance Development Division. April 29, 1944.
- M2** Analysis of variations in the spread of air travel-to-arming. (Report No. OD-7-103.) B. M. Bennett. [NBS, Ordnance Development Division.] April 11, 1945.
- M3** Arming of VT bomb fuzes. Analysis and measurement of spread in air travel-to-arming. (Report No. OD-2-275.) A. L. Leiner. [NBS, Ordnance Development Division.] March 15, 1946.

244.2 Velocity

- M1** Arming considerations for HVAR. (Memorandum No. OD-BE-17M.) Bertrand J. Miller. [NBS, Ordnance Development Division.] July 12, 1944.

245 Interaction of Fuzes

- M1** Salvo firing in search of sympathetic functioning [using] sixty M-2 (MC-380) [and] sixty M-3 (MC-382) fuzes [at] Aberdeen, June 23, 1943. (Report No. OD-1-15.) T. N. White. NBS, Ordnance Development Division. September 25, 1943.
- M2** Interaction factors for BRLG units. (Memorandum No. OD-BE-48M.) Franklin M. Fletcher. [NBS, Ordnance Development Division.] September 11, 1944.
- M3** Mutual interaction in BRLG units dropped in close spaced train. (Memorandum No. OD-BE-

44M.) Bertrand J. Miller. [NBS, Ordnance Development Division.] September 11, 1944.

- M4** Electrical interaction of T-50 fuzes. (Part II. Report No. OD-BE-42R.) Bertrand J. Miller. NBS, Ordnance Development Division. September 29, 1944.

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Jamming

- M1** Repeater jamming of proximity fuzes. (Division 15. Report No. 1305-26.) Russell Yost, Jr. and Walter E. Tolles. OEMsr-1305; Service Project Nos. SC-98.07 and NA-109. Airborne Instruments Laboratory, Inc. January 27, 1946.

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Sunfiring

- M1** Sunfiring. Willis E. Armstrong. [NBS, Ordnance Development Division.] November 19, 1942.
- M2** A method for preventing sunfiring. Thomas M. Marion. [NBS, Ordnance Development Division.] July 8, 1943.
- M3** Sunfiring of photoelectric fuzes on rockets, June 1 to 8, 1943. (Memorandum No. 392-T.) H. F. Stimson. Service Project No. OD-27. NBS, Ordnance Development Division. September 3, 1943.
- M4** A sunproof modification of the MC-380 fuze. (Report No. OD-2-21.) J. G. Hoffman, R. F. Morrison, Jr. and Glenn L. Scillian. NBS, Ordnance Development Division. September 4, 1943.
- M5** A further study of the sunproof modification of the MC-380 fuze. (Report No. OD-2-5.) Glenn L. Scillian, R. F. Morrison, Jr. and J. G. Hoffman. [NBS, Ordnance Development Division.] [November 22, 1943.]

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Light Intensities

- M1** Night photoelectric fuze. John F. Streib. [NBS, Ordnance Development Division.] April 16, 1942.
- M2** Light measurements made on the altitude flights of August 23 and 28, 1942. [J. G. Hoffman.] [NBS, Ordnance Development Division.] [August, 1942.]
- M3** Measurement of light intensities at altitudes up to 25,000 feet. (n.a.) [NBS, Ordnance Development Division.] September 14, 1942.
- M4** Light level values for the north sky. (Report No. OD-2-12.) Ralph Stair and William E. Williams, Jr. NBS, Ordnance Development Division. July 3, 1943.

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TOSS BOMBING

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Theory of Toss Bombing

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Toss-Bombing Angles

- M1** Mathematical investigation of some phases of toss bombing. [Philip R. Karr.] [NBS, Ordnance Development Division.] March 26, 1943.
- M2** Mathematical study of toss bombing in the general case. (Interim Report No. 7.) Irvin H. Swift.

OEMsr-769. State University of Iowa. May 22, 1943.

- M3** Toss bombing, summary of proof data. (Report No. OD-4-10.) William B. McLean and William L. Whitson. NBS, Ordnance Development Division. November 30, 1943.
- M4** Dive toss bombing. (Report No. OD-4-58.) William L. Whitson. NBS, Ordnance Development Division. June 1, 1944.
- M5** Progress reports of Special Group on Toss Bombing [covering period from] July 24, 1944 to January, 1946. W. S. Hinman, Jr., William B. McLean and others. NBS, Ordnance Development Division.
- M6** Excerpts from University of Iowa reports concerning the theory of toss bombing. (Report No. A-S117BT.) (n.a.) OEMsr-769. State University of Iowa. August 5, 1944.
- M7** A discussion of toss-bombing data taken at Wright Field. (Technical Paper No. A-S120-ERDS.) Robert E. Holland. OEMsr-769. State University of Iowa. August 11, 1944.
- M8** Toss bombing with target motion. (AMG Working Paper No. 293.) Harry Pollard. AMG-Columbia. October 24, 1944.
- M9** The elements of toss bombing. (Technical Paper No. REI-TMD-115. Revision 1.) Irvin H. Swift. OEMsr-769. State University of Iowa. [November, 1944.]
- M10** A theory of toss bombing. (AMP Report No. 146.1R.) Harry Pollard. OEMsr-1007. AMG-Columbia. September, 1945.

311.1 Pull-Up Angle

- M1** General toss-bombing solution for the case of a non-constant acceleration, including the effect of the pull-up angle. (Report No. OD-SP-48.) Albert London. NBS, Ordnance Development Division. November 3, 1944.
- M2** Analysis of horizontal range error resulting from neglect of pull-up angle. (Report No. OD-SP-45.) S. H. Lachenbruch. NBS, Ordnance Development Division. November 7, 1944.
- M3** Relationships among important angles in toss-bombing trajectories. (Report No. OD-SP-49.) S. H. Lachenbruch. NBS, Ordnance Development Division. November 10, 1944.
- M4** Effect of a constant angle between the sight line and the flight line in tossing projectiles. (Technical Paper No. TC-2-1-45.) M. E. Rolfs. OEMsr-769. State University of Iowa. February 24, 1945.
- M5** Exact solution of toss-bombing equations for circular pull-up. (Report No. OD-SP-98.) S. H. Lachenbruch, Albert London and C. F. Eve. NBS, Ordnance Development Division. March 23, 1945.
- M6** Pull-up angle at the start of integration. (Technical Report No. TC-4-6-45.) Philip G. Hubbard. OEMsr-769. State University of Iowa. Revised: July 4, 1945.
- M7** Ψ function for non-constant pull-up acceleration.

(Report No. OD-SP-123.) C. F. Eve and Albert London. NBS, Ordnance Development Division. July 10, 1945.

311.2 Sight Depression Angle

- M1** Dependence of range on the allowable sight depression in dive bombing. (Report No. OD-SP-117.) S. H. Lachenbruch. NBS, Ordnance Development Division. May 11, 1945.

311.3 Striking Angle for Level-Flight Bombing

- M1** Equations for toss bombing for the horizontal case, assuming acceleration is a function of the time. (Report No. OD-TB-19.) William B. McLean. NBS, Ordnance Development Division. August 31, 1944.
- M2** Striking angles and velocities for level-flight bombing. (Report No. OD-7-87R.) Allen T. Foster. NBS, Ordnance Development Division. March 20, 1945.
- M3** Striking angles and velocities for level-flight bombing [with the M-65 bomb]. (Report No. OD-2-223R. Supplement to Report No. OD-7-87R.) Allen T. Foster. NBS, Ordnance Development Division. June 5, 1945.
- M4** Striking angles and velocities for level-flight bombing with M-57. (Report No. OD-2-257R. Supplement to Report No. OD-7-87R.) Allen T. Foster. NBS, Ordnance Development Division. July 18, 1945.
- M5** Equivalent release conditions for level-flight bombing and dive bombing. (Technical Memorandum No. OD-1-TM-2.) Irene Freuder, F. L. Celauro and T. N. White. NBS, Ordnance Development Division. October 30, 1945.

311.4 Angle of Attack

- M1** Angle of attack of the boresight datum line in the F6F-5. (Memorandum No. OD-SP-74M.) Robert E. Holland. [NBS, Ordnance Development Division.] January 1, 1945.
- M2** Angle of attack of thrust line [of the] plane SB2C-4, Serial Number 20354. (Report No. OD-SP-104.) John H. Park. NBS, Ordnance Development Division. April 14, 1945.
- M3** Angle of attack of thrust line [of the] plane F6F, No. 77555. (Report No. OD-SP-112.) L. J. Jelsch. NBS, Ordnance Development Division. May 7, 1945.
- M4** Angle of attack of boresight datum line for SB2C-5, F4U and F6F-5 airplanes. (Report No. OD-SP-124.) John H. Park. NBS, Ordnance Development Division. June 22, 1945.

312 Errors and Corrections

312.1 Sight Alignment

- M1** Effect of changing integrator RC ratio to correct for an error in alignment of sight with line of flight. (Report No. OD-SP-40.) William B. Mc-

Lean. NBS, Ordnance Development Division. October 26, 1944.

M2 Method of checking the alignment of the sight with the flight line in a dive. (Memorandum No. OD-SP-47M.) William B. McLean. [NBS, Ordnance Development Division.] November 16, 1944.

M3 The effect of sight misalignment and angle of attack variation. (Report No. OD-SP-131.) S. H. Lachenbruch. NBS, Ordnance Development Division. July 23, 1945.

312.2 Dive Angle Correction Factor

M1 Bridge for adjustment of Ψ for different plane velocities. (Report No. OD-TB-33.) Harold N. Cones. NBS, Ordnance Development Division. September 28, 1944.

M2 Revised computation of gyro output voltage at 40 degrees dive angle for different plane velocities. (Addendum to Report No. OD-TB-33.) S. H. Lachenbruch. NBS, Ordnance Development Division. October 25, 1944.

M3 Use of the 100-ft horizontal error curves for errors of other magnitudes. (Report No. OD-SP-46.) S. H. Lachenbruch. NBS, Ordnance Development Division. November 8, 1944.

M4 Variation of integrator Ψ function with velocity, neglecting air resistance. (Report No. OD-SP-41.) R. De Amicis. NBS, Ordnance Development Division. November 14, 1944.

M5 Tables of new Ψ functions and other related quantities. (Report No. OD-SP-77.) C. F. Eve and Albert London. NBS, Ordnance Development Division. January 15, 1945.

M6 New Ψ card design. (Report No. OD-SP-78.) Albert London and A. E. Willgoos. NBS, Ordnance Development Division. January 17, 1945.

M7 An analytical method for correcting systematic toss-bombing errors, involving revision of the Ψ function. (Report No. OD-SP-150.) S. H. Lachenbruch. NBS, Ordnance Development Division. November 30, 1945.

312.3 Altitude Ratio Errors

M1 Horizontal range errors resulting from altitude ratio errors. (Report No. OD-SP-80.) Arnold Wexler and Albert London. NBS, Ordnance Development Division. January 18, 1945.

312.4 Wind Corrections

M1 Measurements of wind velocity with the directional gyro. (Report No. OD-SP-53.) William L. Whitson. NBS, Ordnance Development Division. November 22, 1944.

M2 Wind correction for toss bombing. (Report No. OD-SP-97.) T. H. Nicholl. NBS, Ordnance Development Division. March 14, 1945.

M3 Wind correction sighting grids for toss bombing. (Report No. OD-SP-106.) Albert London and A. E. Willgoos. NBS, Ordnance Development Division. May 11, 1945.

M4 Range wind correction for toss bombing. (Report No. OD-SP-107.) Albert London and C. F. Eve. NBS, Ordnance Development Division. June 5, 1945.

312.5 Air Resistance Corrections

M1 A preliminary analysis of the effect of air resistance on certain aspects of toss bombing. (Report No. A-308.) S. H. Lachenbruch. Service Project Nos. AC-62 and NO-185; OSRD No. 4589. NBS, Ordnance Development Division. September, 1944.

M2 Correction of the acceleration integrator for air resistance. (Report No. OD-SP-76.) S. H. Lachenbruch. NBS, Ordnance Development Division. January 12, 1945.

313 Trajectories

M1 Toss-bombing trajectories. (Memorandum No. OD-OAG-32.) F. L. Celauro and D. Fisher. [NBS, Ordnance Development Division.] September 6, 1944.

314 Operational Range Limits

M1 Range limitations resulting from approximations in toss-bombing equations. (Report No. OD-SP-105.) S. H. Lachenbruch. NBS, Ordnance Development Division. April 16, 1945.

M2 Tables of operational limits in toss bombing. (Memorandum No. OD-SP-140M.) C. F. Eve. [NBS, Ordnance Development Division.] October 29, 1945.

315 Radar Aids to Toss Bombing

M1 Use of radar range for toss bombing. (Division 14. Report No. 63.) J. R. Rogers and J. W. Gray. [MIT, Radiation Laboratory.] April 21, 1943.

316 Pull-Up Time

M1 Pull-up acceleration as a function of time for F6F and TBM flights releasing rockets and bombs. (Memorandum No. MC-2-4-45.) A. H. Crippen. OEMsr-769. State University of Iowa. February 24, 1945.

317 Rack-Lag Time

M1 Rack-lag time for Mark 50 and Mark 46, Model 1 racks with AN/ASG-10 gear. (Report No. OD-SP-136.) A. E. Peterson. NBS, Ordnance Development Division. August 23, 1945.

318 Flight Curves

M1 Flight curves for Patuxent planes. (Memorandum No. OD-SP-61M.) F. R. Kotter. [NBS, Ordnance Development Division.] November 25, 1944.

320 Toss-Bombing Equipment

321 Directors

SECRET

321.1 AN/ASG-10 Director

- M1** Introduction to operation of bomb director, AN/ASG-10(XN). (Report No. OD-SP-67.) W. S. Hinman, Jr. NBS, Ordnance Development Division. December 15, 1944.
- M2** Pilot production of toss-bombing equipment. (n.a.) [OEMsr-1227.] Bowen and Company, Inc. [May, 1945.]
- M3** Type test of AN/ASG-10, Serial Numbers 1004 and 1555 [covering the period from] July 6 to August 13, 1945. (n.a.) Magnavox Company.
- M4** Type test of AN/ASG-10A [covering the period from] November 26 to 29, 1945. C. B. Fine and W. Harl. Magnavox Company.
- M5** [The] AN/ASG-10 bomb director. Development, design and production. R. H. Dreisbach, N. F. Martin and others. OEMsr-1417. Magnavox Company. May 9, 1946. Includes: Pilot's operating manual for bomb director Mark 1, Model 1, AN/ASG-10. (Report No. CO NAVAER 08-5S-501.) (n.a.) US Navy Department. January 17, 1945. Handbook of maintenance instructions for bomb director Mark 1, Model 1, AN/ASG-10. (Report No. CO-AN 16-30ASG10-7.) (n.a.) US Navy Department. August 1, 1945. Operator's manual for bomb director Mark 1, Model 2, AN/ASG-10A. (Report No. CO NAVAER 16-5S-524.) (n.a.) US Navy Department. June 15, 1945.

321.11 AN/ASG-10 Components

- M1** Humidity tests on production AN/ASG-10 and various cables. (Report No. OD-SP-96.) J. L. Pike and Joseph Johansen. NBS, Ordnance Development Division. March 12, 1945.
- M2** Summary of time in air for all toss-bombing equipment at Patuxent from October 28, 1944 to March 19, 1945, listing all faults in equipment and adjustments made. (Report No. OD-SP-100.) John H. Park. NBS, Ordnance Development Division. March 27, 1945.
- M3** Further humidity tests on AN/ASG-10 computer, cables, connectors and altimeter. (Report No. OD-SP-96a.) J. L. Pike and Joseph Johansen. NBS, Ordnance Development Division. April 13, 1945.
- M4** Maintenance notes on AN/ASG-10(XN) equipment. (Report No. OD-SP-109.) F. M. Defandorf. NBS, Ordnance Development Division. May 1, 1945.
- M5** Humidity tests on AN/ASG-10 computer, pilot's control box, altimeter and sealed chamber terminals. (Report No. OD-SP-96b.) Joseph Johansen and J. L. Pike. NBS, Ordnance Development Division. May 14, 1945.
- M6** A list of unsatisfactory features in Models 1 and 2 equipment and some remedies. (Memorandum No. OD-SP-126M.) F. M. Defandorf. [NBS, Ordnance Development Division.] August 14, 1945.

321.2 Mark I

- M1** Tests on effect of aircraft radio and intercommuni-

cation system on operation of Mark 1 bomb director. (Report No. OD-SP-71.) A. E. Peterson and C. Weaver Creed. NBS, Ordnance Development Division. December 29, 1944.

- M2** Difference between bomb directors Mark 1, Model 0 and Mark 1, Model 1. (Memorandum No. OD-SP-73M.) F. B. Silsbee. [NBS, Ordnance Development Division.] January 9, 1945.
- M3** Bomb director Mark 1, Model 1 specifications. (Memorandum No. OD-SP-112M.) F. B. Silsbee. [NBS, Ordnance Development Division.] June 11, 1945.
- M4** Effect of variation in dive angle and release altitude on operation of Mark 1, Model 1 bomb director in an SB2C-4 airplane. (Report No. OD-SP-152.) E. U. Rotor. [NBS, Ordnance Development Division.] January 10, 1946.

321.3 Director Performance

- M1** Bomb director performance at Naval Air Station, Patuxent River, Md., November 7, 1944 to June 30, 1945. (Report Nos. OD-SP-55, -63, -69, -73, -82, -93, -102, -113, -118 and -127.) P. V. Johnson and John H. Park. NBS, Ordnance Development Division. November 22, December 8, 16, 30, 1944 and February 16, March 10, April 10, May 8, June 14 and July 12, 1945.
- M2** Effect of variation in dive angle and release altitude on bomb director operation in SB2C planes. (Report No. OD-SP-65.) P. V. Johnson and John H. Park. NBS, Ordnance Development Division. December 27, 1944.
- M3** Effect of variation in dive angle and altitude of release on bomb director performance in an F6F-5 airplane. (Report No. OD-SP-72.) John H. Park. NBS, Ordnance Development Division. December 30, 1944.

321.4 Bomb Director Tests

- M1** Description of test unit Mark 16, Model 0. (Report No. OD-SP-87.) V. W. Cohen. NBS, Ordnance Development Division. March 1, 1945.
- M2** Instructions for test of bomb director Mark [1] Model 1 prior to installation. Supplement to the Magnavox handbook. (Report No. OD-SP-137.) V. W. Cohen. NBS, Ordnance Development Division. August 25, 1945.
- M3** Translation of Ziess' report on TSA-2 low-level and dive bomb director. (Report No. OD-SP-140.) F. B. Silsbee. [NBS, Ordnance Development Division.] August 31, 1945.
- M4** Portable DC-operated test unit. (Report No. OD-SP-141.) V. W. Cohen. NBS, Ordnance Development Division. September 4, 1945.
- M5** Quality control report for bomb director test equipment . . . Mark 17, Model O, TS-362/ASG-10, Serial Numbers 204 and 212. [C. B. Fine and W. Harl.] Magnavox Company. September 25 and 26, 1945.

322 Altimeters**322.1 AN/ASG-10 Altimeter**

- M1** Modified Kollsman altimeter for toss-bombing equipment. (Report No. OD-SP-58.) B. L. Wilson and Arnold Wexler. NBS, Ordnance Development Division. December 2, 1944.
- M2** Vibration tests of modified Kollsman altimeter for toss-bombing equipment. (Report No. OD-SP-79.) B. L. Wilson and Arnold Wexler. NBS, Ordnance Development Division. January 17, 1945.
- M3** Altimeter shock mounts. (Report No. OD-SP-130.) Arnold Wexler. NBS, Ordnance Development Division. July 23, 1945.
- M4** An improved altimeter unit circuit for AN/ASG-10. (Report No. OD-SP-133.) J. L. Pike. NBS, Ordnance Development Division. August 1, 1945.

322.2 Electrical Altimeters

- M1** Results of field test of electrical indicating altimeter. (Memorandum No. OD-SP-64M.) Joseph H. Hibbs. [NBS, Ordnance Development Division.] December 14, 1944.
- M2** Progress of development of the EIA, electrical indicating altimeter. (Report No. OD-SP-66.) Joseph H. Hibbs. NBS, Ordnance Development Division. December 19, 1944.
- M3** Laboratory tests of electrical altimeter No. 2 for use with toss-bombing equipment. (Report No. OD-SP-99.) Arnold Wexler and Ray F. Smith, Jr. NBS, Ordnance Development Division. March 24, 1945.

322.3 Aneroid Altimeters

- M1** A photoelectric altimeter for use with toss-bombing equipment. (Report No. OD-SP-128.) Arnold Wexler, Harold N. Cones and Fred Nemir. NBS, Ordnance Development Division. August 7, 1945.
- M2** The calibration of two altimetric slides. (Report No. OD-SP-142.) Arnold Wexler and Robert L. Nutter. NBS, Ordnance Development Division. September 6, 1945.
- M3** A short description of the technique of dynamic testing of aneroid altimeters and barometers. (Report No. OD-SP-147.) Arnold Wexler. NBS, Ordnance Development Division. October 11, 1945.

322.4 Altimeter Components**322.41 Whiskers**

- M1** Cycling test of Raymond modified altimeter with new whisker design. (Memorandum No. OD-SP-84M.) Arnold Wexler. [NBS, Ordnance Development Division.] January 31, 1945.
- M2** Altimeter contacts. (Memorandum No. OD-SP-119M.) F. M. Defandorf. [NBS, Ordnance Development Division.] July 11, 1945.
- M3** Variations in overhang of altimeter whisker. (Addendum to Memorandum No. OD-SP-119M.) F. M. Defandorf. [NBS, Ordnance Development Division.] August 13, 1945.

322.42 Miscellaneous Components

- M1** Laboratory tests of an altitude switch for use with toss-bombing equipment. (Report No. OD-SP-85.) Arnold Wexler, B. L. Wilson and F. O. Harrer. NBS, Ordnance Development Division. February 16, 1945.
- M2** Tactical limitations of the modified altimeter circuit. (Report No. OD-SP-146.) Albert London and S. H. Lachenbruch. NBS, Ordnance Development Division. October 2, 1945.

322.5 Miscellaneous Altimeter Research

- M1** Test of X-2 altimeter. ([Parts] A to D. Engineering Report No. 226.) T. H. Carter. [OEMsr-1378.] Raymond Engineering Laboratory, Inc. January 18, 20, 26 and February 2, 1945.
- M2** Change in drag tolerances of altimeter unit. (Memorandum No. OD-SP-136M.) Arnold Wexler. [NBS, Ordnance Development Division.] October 11, 1945.

323 Sights and Sighting**323.1 Sights**

- M1** An introduction to the analytical principles of lead-computing sights. (AMP Memorandum No. 55.1.) Saunders McLane. AMG-Columbia. March 27, 1944.
- M2** [The K-11, or Mark 21 sight as an aid to toss bombing.] Report of visit to Massachusetts Institute of Technology, February 16, 1945. (Memorandum No. OD-SP-87M.) William B. McLean. [NBS, Ordnance Development Division.] February 23, 1945.
- M3** [The K-14 sight.] Trip to Eglin Field, March 3 to 8, 1945. (Memorandum No. OD-8-92M.) William B. McLean. [NBS, Ordnance Development Division.] March 16, 1945.

323.2 Sight Setting

- M1** Gunsight setting on P-47 airplane for toss bombing. (Report No. OD-SP-51.) William L. Whitson. NBS, Ordnance Development Division. November 10, 1944.
- M2** Sight line adjusted off line of flight. (Memorandum No. OD-SP-43M.) William L. Whitson. [NBS, Ordnance Development Division.] November 11, 1944.
- M3** Sight settings. (Memorandum No. OD-SP-44M.) P. V. Johnson. [NBS, Ordnance Development Division.] November 13, 1944.
- M4** Sight setting for TBM-1C as determined with the aid of a theodolite on December 6, 1944, at Patuxent. (Memorandum No. OD-SP-75M.) Albert G. Hoyem. [NBS, Ordnance Development Division.] January 1, 1945.
- M5** Theodolite measurement of sight setting for SB2C-4, No. 19717. (Memorandum No. MC-3-1-45.) A. H. Crippen. OEMsr-769. State University of Iowa. March 10, 1945.

324 Computers (or, Integrators)

M1 Integrators. (Weekly Progress Report Nos. 36, 39A to 51A, 58A to 69A; A-P120, A-P122, A-P124, A-P125, A-P127, A-P129, A-P131, A-P133, A-P135, A-P137, A-P140, A-P142, A-P144, A-P147, A-P149; PA-46-44 to PA-52-44; PA-1-45 to PA-5-45 and PA-11-45 to PA-16-45 for . . . December 11, 1943, January 1, 1944 to March 25, 1944; May 13, 1944 to February 3, 1945; March 17, 1945 to April 21, 1945.) James A. Jacobs, Irvin H. Swift and others. OEMsr-769. State University of Iowa.

324.1 Types**324.11 Acceleration Integrator**

M1 Toss bombing. Acceleration integrator bomb release. (Memorandum No. 5-S.) William B. McLean, William L. Whitson and Jacob Rabinow. NBS, Ordnance Development Division. May 16, 1943.

M2 Toss bombing. Compensating acceleration integrator bomb release, including field test data. (Memorandum No. 7-S.) William B. McLean and William L. Whitson. Service Project No. AC-62. NBS, Ordnance Development Division. August 14, 1943.

324.12 Reversing Electrical Integrator

M1 Reversing integrator with hyperbolic slidewire. (Report No. OD-4-57.) William L. Whitson. NBS, Ordnance Development Division. May 22, 1944.

M2 The use of a reversing electrical integrator in low-level toss bombing with a TBM airplane. (Report No. OD-TB-15.) F. R. Kotter. NBS, Ordnance Development Division. August 25, 1944.

324.13 Fixed-Time Integrator

M1 Toss bombing with a TBM airplane using a fixed-time integrator. (Report No. OD-TB-10.) F. R. Kotter. NBS, Ordnance Development Division. August 21, 1944.

324.14 Mark 20

M1 Bench tests on Magnavox computers. (Report No. OD-SP-91.) R. W. Gustafson. NBS, Ordnance Development Division. February 24, 1945.

M2 Relay lag timing errors in the Mark 20, Model 2 computer. (Report No. OD-SP-153.) F. R. Kotter. NBS, Ordnance Development Division. January 31, 1946.

324.15 AN/ASG-10

M1 Protek (silica gel) dryer plugs used in computer for AN/ASG-10. (Report No. OD-SP-111.) Harold N. Cones. NBS, Ordnance Development Division. May 2, 1945.

324.2 Components**324.21 Circuits**

M1 Alternative integrator circuit. (Memorandum No. OD-SP-58M.) F. B. Silsbee. [NBS, Ordnance Development Division.] December 2, 1944.

M2 Operation of toss-bombing integrator circuit. (Report No. OD-SP-60.) Albert London. NBS, Ordnance Development Division. December 7, 1944.

M3 The effect of certain modifications in the integrator circuit. (Memorandum No. MC-2-1-45.) Irvin H. Swift. OEMsr-769. State University of Iowa. February 17, 1945.

324.22 Miscellaneous Components

M1 Integrator brushes and commutator. (Report No. OD-SP-52.) Forest K. Harris. NBS, Ordnance Development Division. November 15, 1944.

M2 Determination of proper radio frequency filter for the thyatron in the integrator. (Report No. OD-SP-57.) Joseph H. Hibbs. NBS, Ordnance Development Division. December 4, 1944.

M3 Results of tests on switches of the microswitch type. (Memorandum No. MC-2-3-45.) T. C. Stephens. OEMsr-769. State University of Iowa. February 24, 1945.

M4 K-bob springs. (Memorandum No. OD-SP-141M.) Arnold Wexler. [NBS, Ordnance Development Division.] November 1, 1945.

324.3 Tests

M1 Vibration tests on integrator during actual flights. (Report No. OD-SP-50.) Leroy R. Sweetman. NBS, Ordnance Development Division. November 6, 1944.

M2 Iowa experience with vibration tests on REIX-T4 units. (Memorandum No. MA-11-1-44.) George S. Carson. OEMsr-769. State University of Iowa. November 21, 1944.

M3 Integrator test procedure. (Memorandum No. MA-1-3-45.) Lloyd O. Herwig. OEMsr-769. State University of Iowa. January 27, 1945.

M4 Flight tests of Iowa integrator mounted on A-1-A and new design shock mount. (Report No. OD-SP-86.) Leroy R. Sweetman. NBS, Ordnance Development Division. February 8, 1945.

M5 Preliminary test procedure for REIX-T4 revised for circuit 326. (Memorandum No. MA-12-1-44.) George S. Carson. OEMsr-769. State University of Iowa. Revised: February 10, 1945.

M6 Leakage effect with combination integrator and PCB. (Memorandum No. MC-1-1-45.) Irvin H. Swift. OEMsr-769. State University of Iowa. Revised: March 31, 1945.

M7 Vibration tests of Magnavox computers. (Report No. OD-SP-121.) C. Weaver Creed and J. L. Pike. NBS, Ordnance Development Division. July 24, 1945.

325**Gyroscopes**

M1 Comparison between actual and theoretical values

of output voltage from gyro potentiometer. (Report No. OD-SP-42.) R. De Amicis. NBS, Ordnance Development Division. November 3, 1944.

- M2** Change of shape of gyro card for Magnavox production. (Memorandum No. OD-SP-67M.) William B. McLean. [NBS, Ordnance Development Division.] December 26, 1944.

- M3** Recommendations on gyro processing at Magnavox on basis of visit to Fort Wayne during week of April 2, 1945. (Memorandum No. OD-SP-104M.) Frank E. Inman. [NBS, Ordnance Development Division.] April 16, 1945.

- M4** [Gyroscopes.] Report on visit to Groves, Sickles and Sperry plants. (Memorandum No. OD-SP-114M.) Frank E. Inman. [NBS, Ordnance Development Division.] June 15, 1945.

- M5** Gyroscope turn error compensation. (Report No. OD-SP-125.) Forest K. Harris and Frank E. Inman. NBS, Ordnance Development Division. July 11, 1945.

- M6** Modification of gyros with CAG-93. (Memorandum No. OD-SP-135M.) Frank E. Inman. [NBS, Ordnance Development Division.] September 17, 1945.

- M7** Instructions for the modification of gyro Mark 20, Model 1. (Report No. OD-SP-144.) Frank E. Inman. NBS, Ordnance Development Division. October 4, 1945.

- M8** Elimination of gyro turn error and automatic caging of gyro. (Memorandum No. OD-SP-142M.) Frank E. Inman. [NBS, Ordnance Development Division.] November 8, 1945.

- M9** The electrically driven attitude gyro. (Memorandum No. OD-SP-144M.) Frank E. Inman. [NBS, Ordnance Development Division.] November 26, 1945.

325.1 Tests

- M1** Procedure for altering and rebalancing the gyro. (Report No. OD-TB-21.) Frank E. Inman. NBS, Ordnance Development Division. September 18, 1944.

- M2** Bridge for checking gyro angle vs voltage. (Report No. OD-TB-25.) Harold N. Cones. NBS, Ordnance Development Division. September 21, 1944.

- M3** Test of electric gyro-caging mechanism. (Engineering Report No. 230.) H. H. Raymond. [OEMsr-1378.] Raymond Engineering Laboratory, Inc. January 27, 1945.

- M4** Tests of electric gyro-caging mechanism with electromagnetic brake. (Engineering Report No. 232.) K. G. Bacheller. [OEMsr-1378.] Raymond Engineering Laboratory, Inc. March 15, 1945.

- M5** Magnavox gyro test fixtures and procedures. (Memorandum No. OD-SP-116M.) Forest K. Harris. [NBS, Ordnance Development Division.] June 27, 1945.

- M6** Tests of pitch-indicating gyro with added freedom

about the roll axis. (Report No. OD-SP-132.) Frank E. Inman. NBS, Ordnance Development Division. July 25, 1945.

- M7** Flight test of Conn pitch-indicating gyro with added freedom about the roll axis. (Report No. OD-SP-134.) Forest K. Harris. NBS, Ordnance Development Division. August 11, 1945.

326 Accelerometers

326.1 Photoelectric

- M1** Rocket and bomb-tossing circuit for use with photoelectric accelerometer. (Preliminary Report No. OD-SP-101.) William B. McLean. NBS, Ordnance Development Division. April 3, 1945.

- M2** Toss director using photoelectric accelerometer, continuous take-off altimeter, and a linear condenser-charging circuit. (Report No. OD-SP-119.) William B. McLean. NBS, Ordnance Development Division. June 22, 1945.

- M3** Photoelectric accelerometer to replace gyro in Mark 1, Models 1 and 2 bomb directors. (Preliminary Report No. OD-8-138.) William B. McLean. NBS, Ordnance Development Division. August 12, 1945.

- M4** Wind compensation of the photoelectric accelerometer when used with a lead-computing sight. (Report No. OD-SP-135.) Albert London. NBS, Ordnance Development Division. August 21, 1945.

326.2 Linderman

- M1** Tests of the Linderman accelerometer. (Memorandum No. OD-SP-124M.) V. W. Cohen. [NBS, Ordnance Development Division.] July 30, 1945.

326.3 Integrating Accelerometer Tests

- M1** Test of integrating accelerometers at Aberdeen, February 27, 1943. (Memorandum No. 98-T.) F. R. Kotter. Service Project No. OD-27. NBS, Ordnance Development Division. March 17, 1943.

- M2** Tests of accelerometers at Aberdeen, March 12, 1943. (Memorandum No. 112-T.) F. R. Kotter and T. C. Hellmers. Service Project No. OD-27. NBS, Ordnance Development Division. March 23, 1943.

- M3** Test of integrating accelerometers, April 6, 1943. (Memorandum No. 152-T.) F. R. Kotter. Service Project No. OD-112. NBS, Ordnance Development Division. April 10, 1943.

- M4** Test of mechanical integrating accelerometer. (Memorandum No. 166-T.) D. A. Worcester and F. R. Kotter. Service Project No. OD-112. NBS, Ordnance Development Division. April 15, 1943.

327 Dive-Angle Indicators

- M1** Solenoid-operating air valve for use with dive-angle indicator. (Memorandum No. OD-SP-62M.) F. M. Defandorf. [NBS, Ordnance Development Division.] December 8, 1944.

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- M2** The photoelectric dive-angle meter. (Report No. OD-SP-74.) William B. McLean, Joseph H. Hibbs and McKay R. Bradley. NBS, Ordnance Development Division. January 8, 1945.
- M3** Conversion of Jack and Heintz horizon to dive-angle indicator. (Memorandum No. OD-SP-85M.) Forest K. Harris. [NBS, Ordnance Development Division.] February 12, 1945.
- M4** Construction of dive-angle indicators (gyro repeaters) for use with AN/ASG-10 gear. (Report No. OD-SP-116.) A. E. Peterson. NBS, Ordnance Development Division. May 21, 1945.
- M5** The modified Linderman dive-angle indicator. (Report No. OD-SP-151.) McKay R. Bradley and F. L. Hermach. NBS, Ordnance Development Division. December 31, 1945.
- 328 Miscellaneous Equipment**
- 328.1 Intervalometers**
- M1** Setting of the intervalometer for toss bombing. (Report No. OD-SP-61.) S. H. Lachenbruch. NBS, Ordnance Development Division. January 1, 1945.
- M2** Stick offset setting nomograph. (Memorandum No. OD-8-SP-133M.) C. F. Eve. [NBS, Ordnance Development Division.] August 30, 1945.
- 328.2 Resistors**
- M1** Investigation of thyatron [No.] 2050 filament voltage. (Memorandum No. MA-1-1-45.) John I. Gansert. OEMsr-769. State University of Iowa. January 20, 1945.
- M2** Compensated vs uncompensated resistors for sensitivity measurements on reaction grid detection units. (Memorandum No. OD-5-242M.) Paul E. Landis. [NBS, Ordnance Development Division.] June 25, 1945.
- M3** Analysis of resistor values needed for Mark 3 circuit. (Report No. OD-SP-145.) Martha Cox, Ray F. Smith, Jr. and A. E. Willgoos. NBS, Ordnance Development Division. September 20, 1945.
- 328.3 Capacitors**
- M1** Further temperature tests on Sprague "Vitamin Q" capacitors, September 28 to December 4, 1944. (Report No. OD-SP-68.) A. E. Peterson and F. O. Harrer. NBS, Ordnance Development Division. December 16, 1944.
- 328.4 Relays**
- 328.41 Tests**
- M1** Checking and adjusting procedure for Clare A-16494 relays. (Report No. A-S138A.) (n.a.) OEMsr-769. State University of Iowa. October 17, 1944.
- M2** Test set for measuring closing time of relays. (Report No. OD-SP-43.) Harold N. Cones. NBS, Ordnance Development Division. October 17, 1944.
- M3** Relay tests. (Report No. OD-SP-54.) Harold N. Cones and F. O. Harrer. NBS, Ordnance Development Division. November 22, 1944.
- M4** Operating time of relay. (Report No. OD-SP-62.) Harold N. Cones. NBS, Ordnance Development Division. December 7, 1944.
- 328.5 Bomb Releases**
- M1** Test of bomb release mechanism. (Memorandum No. 4-S.) William B. McLean and Jacob Rabinow. Service Project No. OD-27. NBS, Ordnance Development Division. March 19, 1943.
- M2** First button releases in SB2C planes, their cause and probable cure. (Report No. OD-SP-103.) John H. Park. NBS, Ordnance Development Division. April 11, 1945.
- 330 Toss-Bombing Tests**
- M1** Toss-bombing tests at Cedar Point Naval Air Station, October 9 to November 4, 1943. (Report No. OD-1-57.) F. R. Kotter. NBS, Ordnance Development Division. November 18, 1943.
- M2** Toss-bombing field data using AYF altimeter and gyro dive-angle attachment. (Report Nos. OD-4-34 and -39.) William L. Whitson. NBS, Ordnance Development Division. February 14 and March 16, 1944.
- M3** Toss-bombing tests at Patuxent. (Report No. OD-4-64.) William L. Whitson. NBS, Ordnance Development Division. May 10, 1944.
- M4** Toss-bombing tests at Patuxent using Kollsman altimeter in SB2C-3 plane. (Report Nos. OD-4-67 and -70.) William L. Whitson. NBS, Ordnance Development Division. May 25 and 29, 1944.
- M5** Field test [of] toss bombing at Patuxent, June 23, 1944. (Report No. OD-1-401.) D. C. Friedman. NBS, Ordnance Development Division. July 14, 1944.
- M6** Toss bombing with an F6F airplane at the Naval Proving Ground, Dahlgren, Va. (Report No. OD-TB-17.) F. R. Kotter. NBS, Ordnance Development Division. August 25, 1944.
- 340 Torpedo Tossing**
- M1** Field tests with toss-bombing equipment adjusted for tossing torpedoes, July 4, 1944 to September 9, 1944, at Patuxent. (Memorandum No. OD-SP-24M.) F. R. Kotter. [NBS, Ordnance Development Division.] September 29, 1944.
- M2** Application of toss-bombing equipment to torpedo tossing. (Report No. OD-SP-56.) Albert London. NBS, Ordnance Development Division. November 28, 1944.
- M3** Installation of toss-bombing equipment in an F7F-1 airplane. (Report No. OD-SP-129.) J. L. Pike. NBS, Ordnance Development Division. July 27, 1945.

400 **ROCKETS AND ROCKET TOSSING**410 **Rockets**

- M1** Rocket fundamentals. An introduction to the theory and practice of military rocket engineering. (Report No. ABL-SR4.) Edited by: Bryce L. Crawford, Jr. OEMsr-273; OSRD No. 3992. George Washington University. 1944.

411 **Rocket Components**411.1 **Motors**

- M1** [Rocket motor.] (NBS Drawing No. 440-R.) (n.a.) NBS, Ordnance Development Division. Revised: September 23, 1941.
- M2** [Cenco rocket] motor. (NBS Drawing No. 440-R.) (n.a.) NBS, Ordnance Development Division. May 20, 1942.
- M3** Tests of miscellaneous rocket motors, May 31, 1942. (Report No. PG-97.) Lauriston S. Taylor. [NBS, Ordnance Development Division.] June 2, 1942.
- M4** Tests of Cenco rocket motors received June 12 and 13. (Preliminary Report No. PG-106.) Lauriston S. Taylor. [NBS, Ordnance Development Division.] June 22, 1942.
- M5** Ballistics of Mark 1 and Mark 7 motors with T-50 and T-51 units and slip factor data for various vehicles. (Report No. OD-1-591.) D. C. Friedman and G. L. Rabinow. NBS, Ordnance Development Division. December 21, 1944.

411.11 **After-Burning**

(See also: 238.212)

- M1** After-burning. Robert D. Huntoon. [NBS, Ordnance Development Division.] March 18, 1943.
- M2** [Test of the] effect of powder lot on after-burning and slivers [at] M Range, Corncake, February 25, 1943. (Report No. OD-1-AB2.) L. C. Miller. NBS, Ordnance Development Division. March 18, 1943.
- M3** Static tests on after-burning [at] Blossom Point, March 23 to 25, 1943. [Part] I, Use of metal sweeps. [Part] II, Use of JP-265 powder. (Preliminary Report No. OD-1-AB8.) L. C. Miller. NBS, Ordnance Development Division. March 29, 1943.
- M4** After-burning. (Progress Report No. OD-1-AB9.) H. F. Stimson. NBS, Ordnance Development Division. April 9, 1943.
- M5** High-angle night firing with powders A-20, A-21 and A-22. After-burning [and] burning distances. (Report No. OD-1-AB14.) H. F. Stimson. NBS, Ordnance Development Division. May 13, 1943.
- M6** After-burning from rocket motors and malfunctioning of VT fuzes. (Report No. OD-1-896.) H. F. Stimson. NBS, Ordnance Development Division. October 15, 1945.

411.2 **Fins**

- M1** Fin. (NBS Diagram Nos. 443, 444 and 447.) (n.a.) NBS, Ordnance Development Division. September 25, and October 15, 1941.

- M2** Experiments on early functioning with Revere motors [at] Corncake, March 2 to 4, 1943. [Part] I, Soldering of fin retaining rings. [Part] II, Tests of powder lot No. 9978. [Part] III, Soldering of fins in open position. (Final Report No. OD-1-AB7.) L. C. Miller. NBS, Ordnance Development Division. March 31, 1943.

411.3 **Launchers**

- M1** Details and material list for launching trailers, Design D. (Drawing Nos. A-30686, A-30687, A-30688 and A-30697.) Edward Jindra. Koppers Company. Revised: March 23, 1942.

411.4 **Sights and Sighting**

- M1** Boresighting and effective angle of attack data for various aircraft. (Division 3. Report No. CIT/UNC-2.) (n.a.) OEMsr-418; Service Project Nos. OD-162, OD-164 and NO-170; OSRD No. 2254. California Institute of Technology. October 25, 1944.
- M2** Sight settings for 2.25-inch, 3.65-inch and 5.0-inch aircraft rockets [fired on] F4U-1, F4U-1D [and] FG-1 [aircraft]. (Division 3. Report No. CIT/UNC-4.) (n.a.) OEMsr-418; OSRD No. 2271. California Institute of Technology. November 14, 1944.
- M3** Sight settings for 2.25-inch, 3.5-inch and 5.0-inch aircraft rockets [fired on] F6F-3 [and] F6F-5 [aircraft]. (Division 3. Report No. CIT/UNC-5.) (n.a.) OEMsr-418; Service Project Nos. OD-162, OD-164 and NO-170; OSRD No. 2272. California Institute of Technology. November 18, 1944.
- M4** Sight settings for 2.25-inch, 3.5-inch and 5.0-inch aircraft rockets [fired on] SB2C-1, SB2C-1C, SB2C-3 [and] SB2C-4 [aircraft]. (Division 3. Report No. CIT/UNC-8.) (n.a.) OEMsr-418; Service Project Nos. OD-162, OD-164 and NO-170; OSRD No. 2275. California Institute of Technology. November 23, 1944.
- M5** Sight settings for 2.25-inch, 3.5-inch and 5.0-inch aircraft rockets fired on TBM-1 [and] TBF-1 [aircraft]. (Division 3. Report No. CIT/UNC-6.) (n.a.) OEMsr-418; OSRD No. 2273. California Institute of Technology. November 28, 1944.
- M6** Sight settings for 2.25-inch, 3.5-inch and 5.0-inch aircraft rockets [fired on] TBM-1C [and] TBF-1C [aircraft]. (Division 3. Report No. CIT/UNC-7.) (n.a.) OEMsr-418; OSRD No. 2274. California Institute of Technology. December 1, 1944.

412 **Ballistics**412.1 **Trajectories**

- M1** Method of computing trajectories and sighting tables for forward-firing aircraft rockets. (Division 3. Report No. CIT/JPC-17.) L. Blitzer and L. Davis, Jr. OEMsr-418; Service Project Nos. NO-33 and NO-170; OSRD No. 3361. California Institute of Technology. February 20, 1944.

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- M2** Trajectories of aircraft rockets, 3.5-inch and 5.0-inch. (Division 3. Report No. CIT/UBC-27.) (n.a.) OEMsr-418; Service Project Nos. OD-162, OD-164 and NO-170; OSRD No. 2225. California Institute of Technology. September 25, 1944.
- M3** Trajectories of 11.75-inch aircraft rockets. (Division 3. Report No. CIT/UBC-30.) (n.a.) OEMsr-418; OSRD No. 2290. California Institute of Technology. November 17, 1944.
- M4** Trajectories of 5.0-inch high-velocity aircraft rocket and 2.25-inch practice round. (Division 3. Report No. CIT/UBC-32.) (n.a.) OEMsr-418; OSRD No. 2314. [California Institute of Technology.] December 15, 1944.
- M5** An empirical equation for trajectory drops of 3.5-inch aircraft rocket. (Technical Paper No. TC-1-1-45.) M. E. Rolfs. OEMsr-769. State University of Iowa. Revised: January 20, 1945.
- M6** Empirical equations for trajectory drops of 11.75-inch aircraft rocket and 5.0-inch high-velocity aircraft rocket. (Technical Paper No. TC-1-3-45.) M. E. Rolfs. OEMsr-769. State University of Iowa. January 27, 1945.
- M7** Empirical equations for trajectory drops of 2.25-inch AR (fast), RP-3 3.5-inch, 5.0-inch AR and RP-3 5.0-inch. (Technical Paper No. TC-3-1-45.) M. E. Rolfs. OEMsr-769. State University of Iowa. March 31, 1945.
- M8** Navy rocket trajectory analysis. (Memorandum No. OD-2-203.) A. L. Leiner. [NBS, Ordnance Development Division.] May 5, 1945.
- M9** Empirical equation for the trajectory drop of present model 11.75-inch aircraft rocket. (Memorandum No. M7-6-1-45.) M. E. Rolfs. OEMsr-769. State University of Iowa. June 6, 1945.
- M10** Revision of empirical equation for trajectory drop of 5.0-inch AR. (Memorandum No. M7-6-2-45.) M. E. Rolfs. OEMsr-769. State University of Iowa. June 6, 1945.
- M11** Note concerning the function $F(\alpha)$. (Memorandum No. M7-6-3-45.) L. E. Ward. OEMsr-769. State University of Iowa. June 13, 1945.

412.2 Rocket Motion

- M1** Frequency of yaw of Budd 4½-inch rockets fired from a plane. (Memorandum No. 47-T.) Theodore B. Godfrey. Service Project No. OD-27. NBS, Ordnance Development Division. February 11, 1943.
- M2** Yaw-reporter test [at] Corncake, July 16, 1943. (Memorandum No. 401-T.) L. C. Miller. Service Project No. OD-27. NBS, Ordnance Development Division. August 9, 1943.
- M3** [Field test of] rotation of M-9A1 with hand-crimped fins [at] Blossom Point, June 30 and July 13, 1944. (Report No. OD-1-588.) D. W. Scott. NBS, Ordnance Development Division. December 18, 1944.
- M4** The motion of aircraft rockets during burning. (Technical Paper No. TC-1-2-45.) L. E. Ward.

OEMsr-769. State University of Iowa. January 13, 1945.

412.3 Damage Probabilities

- M1** Probability that a 4½-inch rocket fired from astern will destroy a twin-engine bomber, JU-88, as a function of the point of burst. (AMP Report No. 21.1R.) (n.a.) SRG-Columbia. July, 1944.
- M2** Optimum burst surface for 4½-inch airborne rocket fired from astern at twin-engine bomber, JU-88. (AMP Report No. 21.2R.) (n.a.) SRG-Columbia. July, 1944.
- M3** Effectiveness of a 4½-inch airborne rocket with T-5 fuze when fired at twin-engine bomber from astern. (AMP Report No. 21.3R.) (n.a.) SRG-Columbia. July, 1944.
- M4** Estimates of damage to military aircraft from a head-on burst of HVAR 5-inch rocket shell as a function of the radius of action of the fuze. (Report No. OD-AG-54. Revised.) B. M. Bennett. NBS, Ordnance Development Division. January 8, 1945.
- M5** Probability of damage computations pertinent to design of fuze for 5-inch AR and 5-inch HVAR. (AMP Study No. 21.) Milton Friedman. SRG-Columbia. January 9, 1945.

412.4 Miscellaneous Rocket Problems

- M1** Rocket targets, as of November 1, 1941. (Progress Report No. A-27.) A. J. Dempster. December 24, 1941.
- M2** Tables of doppler frequency vs altitude of release at 200 miles per hour for carrier frequencies. (Report No. OD-OAG-42.) (n.a.) [NBS, Ordnance Development Division.] [September 19, 1944.]
- M3** Summary of ballistic data for Mark 7 California Institute of Technology rocket. (Memorandum No. OD-OAG-45.) F. A. Ransom. NBS, Ordnance Development Division. September 28, 1944.
- M4** Calculations concerning radius of action in plane-to-plane application. (Memorandum No. OD-BE-82M.) Bertrand J. Miller. NBS, Ordnance Development Division. November 14, 1944.
- M5** An upper limit for angular mil separation in range between two rockets launched simultaneously. (Report No. MC-1-2-45.) Carl E. Noble. OEMsr-769. State University of Iowa. January 6, 1945.
- M6** Striking angles and vertical components of striking velocities of rockets fired from an airplane in dive. (Memorandum No. OD-2-261M.) F. L. Celauro. NBS, Ordnance Development Division. July 25, 1945.
- M7** Notes on loading, assembly and storage procedures in rocket testing at Blossom Point Proving Ground. (Report No. OD-1-TM-19.) R. G. Tobey and L. T. Johnson. NBS, Ordnance Development Division. September 25, 1945.
- M8** Notes on mock-plane target, rocket launchers and firing procedures at Blossom Point. (Technical

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Memorandum No. OD-1-TM-20.) A. P. Suttan. NBS, Ordnance Development Division. September 25, 1945.

- M9** Notes on drainage, firing tower constructions, fire prevention and observational procedures at Blossom Point Proving Ground. (Technical Memorandum No. OD-1-TM-21.) R. G. Tobey. NBS, Ordnance Development Division. September 25, 1945.

413 Rocket Flight Tests

- M1** Rocket flight tests at Aberdeen, February 5 [1942]. (Report No. PG-48.) Lauriston S. Taylor. [NBS, Ordnance Development Division.] February 17, 1942.
- M2** Flight tests on 3¼-inch rockets. (Report No. PG-87.) Lauriston S. Taylor. [NBS, Ordnance Development Division.] May 16, 1942.
- M3** Acceptance tests of Westinghouse M-1, 3¼-inch rockets carrying M-1 photoelectric fuzes at Aberdeen, December 9, 1942. (Report No. 425.) Lauriston S. Taylor. [NBS, Ordnance Development Division.] December 15, 1942.

420 Rocket Tossing

421 Theory

- M1** Rocket tossing. (Weekly Progress Report Nos. PC-46-44 to PC-52-44, PC-1-45 to PC-17-45 and P7-18-45 [covering the period from November 18, 1944 to May 5, 1945.] Irvin H. Swift, Carl E. Noble and others. OEMsr-769. State University of Iowa.
- M2** Rocket-tossing theory. (Report No. OD-SP-90.) Albert London and C. F. Eve. NBS, Ordnance Development Division. February 24, 1945.
- M3** Rocket-tossing theory. (Technical Report No. T7-7-2-45.) Irvin H. Swift. OEMsr-769. State University of Iowa. July 25, 1945.

421.1 Pull-Up Time

- M1** An equation for the rocket-tossing pull-up time, T_p . (Technical Paper No. TC-2-2-45.) L. E. Ward. OEMsr-769. State University of Iowa. February 24, 1945.
- M2** Values of the A factor for rocket tossing. (Technical Paper No. TC-4-2-45.) Irvin H. Swift. OEMsr-769. State University of Iowa. April 7, 1945.
- M3** An equation for the rocket-tossing pull-up time T_p when spatial acceleration varies with time. (Technical Paper No. TC-4-3-45.) L. E. Ward. OEMsr-769. State University of Iowa. April 7, 1945.
- M4** The effect of change in angle of attack of an airplane on rocket-tossing pull-up time. (Technical Paper No. T7-5-2-45.) L. E. Ward. OEMsr-769. State University of Iowa. May 30, 1945.

421.2 Mean Point of Impact (MPI)

- M1** Rocket tossing. Results of SP-5 tests with the

TBM-1C at Patuxent. (Memorandum No. MC-1-3-45.) Albert G. Hoyem. OEMsr-769. State University of Iowa. January 13, 1945.

- M2** The method of reducing aircraft data used by the University of Iowa Rocket Tossing Group at the Naval Ordnance Test Station, Inyokern, California. (Memorandum No. MC-2-2-45.) Carl E. Noble. OEMsr-769. State University of Iowa. February 17, 1945.
- M3** The effect of plane velocity on mean point of impact in tossing rockets at Patuxent. (Memorandum No. MC-4-1-45.) Robert E. Holland. OEMsr-769. State University of Iowa. April 14, 1945.
- M4** Shift in mean point of impact with change in a factor in rocket tossing. (Memorandum No. MC-4-2-45.) Irvin H. Swift. OEMsr-769. State University of Iowa. April 28, 1945.

422 Rocket-Tossing Equipment

422.1 Sights and Sighting

- M1** The failure of the Mark 18 as a collision course determiner. (AMG Report No. 371.) Harry Polard. AMG-Columbia. February 20, 1945.
- M2** Summary of data on tossing 3.5-inch AR's obtained with TBM-1C No. 45473 at Patuxent. (Technical Paper No. TC-4-4-45.) Albert G. Hoyem. OEMsr-769. State University of Iowa. April 14, 1945.
- M3** Wind corrections for the toss sight in forward firing of rockets from aircraft. (Technical Paper No. TC-4-5-45.) M. E. Rolfs. OEMsr-769. State University of Iowa. April 21, 1945.
- M4** Sight settings for tossing compared with California Institute of Technology attack-angle values. (Memorandum No. M7-5-1-45.) T. C. Stephens. OEMsr-769. State University of Iowa. May 5, 1945.
- M5** The results obtained from launching 5.0-inch HVAR with the toss sight in an F4U-1D at Inyokern. (Technical Report No. T7-6-2-45.) Philip G. Hubbard. OEMsr-769. State University of Iowa. June 20, 1945.
- M6** The results obtained from firing 5.0-inch HVAR with the toss sight in an F6F-5 at Inyokern. (Technical Paper No. TC-4-1-45.) Carl E. Noble. OEMsr-769. State University of Iowa. Revised: July 18, 1945.

422.2 Directors

- M1** Operation of the AN/ASG-10 Mark 1, Model 2 bomb-rocket director for rocket tossing. (Technical Report No. T7-6-1-45.) Irvin H. Swift. OEMsr-769. State University of Iowa. June 13, 1945.

422.3 Integrators

- M1** Actual operation of an REIX combination unit when spatial acceleration varies with time. (Technical Paper No. T7-5-1-45.) Philip G. Hubbard.

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OEMsr-769. State University of Iowa. May 5, 1945.

423 Rocket-Tossing Tests

M1 Test program on rocket tossing at Patuxent. (Report No. A-S-146EP.) Irvin H. Swift and J. A. Jacobs. State University of Iowa. November 4, 1944.

M2 General summary of rocket-tossing field tests. (Technical Report No. T7-7-3-45.) Albert G. Hoyem. OEMsr-769. State University of Iowa. July 25, 1945.

500 MORTARS

510 Ballistics

511 General T-25 Ballistic Tests

M1 Ballistic data on the T-25 mortar shell. (Report No. OD-4-103, Supplement No. 1.) L. M. Andrews. NBS, Ordnance Development Division. August 25, 1945.

M2 Field test [of] ballistics of T-25 mortar shells [at] Blossom Point, October 29, 30, 31 and November 2, 1945. (Report No. OD-1-901.) G. Rabinow. NBS, Ordnance Development Division. November 29, 1945.

M3 Physical tests of T-25 shell sections. (Report No. OD-4-103, Supplement No. 5.) Louis Schuman. NBS, Ordnance Development Division. December 26, 1945.

M4 T-25 ballistic data. (Report No. OD-4-103, Supplement No. 4.) L. M. Andrews. NBS, Ordnance Development Division. January 23, 1946.

512 Trajectories

M1 MRLG apex firing and generator regulation. (Report No. OD-3-142.) Chester H. Page. NBS, Ordnance Development Division. May 9, 1944.

M2 Selection of screen grid voltage divider for MRLG-1, T-132, in connection with apex firing problem. (Report No. OD-3-221.) George Nordquist. NBS, Ordnance Development Division. March 10, 1945.

M3 The calculation of trajectories. (Technical Report No. T3-8-1-45.) L. E. Ward. OEMsr-769. State University of Iowa. August 29, 1945.

M4 The effects on trajectories of small changes in initial conditions with application to wind corrections. (Technical Report No. T3-9-1-45.) L. E. Ward. OEMsr-769. State University of Iowa. September 12, 1945.

513 Fin and Tail Shapes

M1 Summary of wind tunnel ballistics of MRLG and MROG fuzes on M-43A-1 shells. (Report No. OD-4-102.) L. M. Andrews. NBS, Ordnance Development Division. April 2, 1945.

M2 Suggestion for new 81-mm mortar shell. (Report

No. OD-4-103.) Jacob Rabinow and L. M. Andrews. NBS, Ordnance Development Division. April 25, 1945.

M3 Effect of a lighter weight fin assembly on stability of the M-56 and T-25 mortar shells. (Report No. OD-4-103, Supplement No. 2.) L. M. Andrews and O. R. Cruzan. NBS, Ordnance Development Division. November 21, 1945.

M4 Effect of fin shape on T-25 mortar ballistics. (Report No. OD-4-103, Supplement No. 3.) L. M. Andrews. NBS, Ordnance Development Division. December 17, 1945.

514 Nose Shapes

M1 Preliminary ballistic measurements on mortar shell M-43A-1 using different types of fuzes. (Report No. OD-4-46 and Supplement Nos. 1 and 2.) L. M. Andrews. NBS, Ordnance Development Division. April 15, June 5 and 17, 1944.

M2 Wind tunnel tests on MRLG units. (Report No. OD-4-76.) L. M. Andrews. NBS, Ordnance Development Division. July 24, 1944.

M3 Ballistic test [of] M-43/56 shell with various fuzes [at] Blossom Point, May 5, 1945. (Report No. OD-1-737.) G. Rabinow. NBS, Ordnance Development Division. May 8, 1945.

515 Muzzle Velocity

M1 An investigation of mortar shell muzzle velocities [at] Blossom Point, January 18, 24 and February 18 and 25, 1946. (Report No. OD-1-909.) G. Rabinow. NBS, Ordnance Development Division. March 14, 1946.

600 FUZE AND FUZE PERFORMANCE TESTING EQUIPMENT

610 Testing Equipment and Devices

611 Reporters

M1 Radio reporters for proximity fuze testing. (Progress Report No. A-53.) Allen V. Astin. OSRD No. 589. NBS, Ordnance Development Division. May 21, 1942.

612 Dynamometers

M1 Turbine dynamometer for determining input torque of gear trains. (Report No. OD-4-63.) Jacob Rabinow and Louis Schuman. NBS, Ordnance Development Division. May 10, 1944.

M2 Torsion wire dynamometer. (Report No. OD-4-105.) Louis Schuman. NBS, Ordnance Development Division. May 26, 1945.

613 Electronic Frequency Meter

M1 Electronic frequency meter. (Report No. OD-2-15.) Charles Ravitsky, Leonard C. Pochop and J. G. Reid, Jr. NBS, Ordnance Development Division. July 26, 1943.

- 614 Rotary Shaker**
M1 Rotary shaker for pre-testing BRLG heads. (Report No. OD-3-7.) Robert D. Huntoon. [NBS, Ordnance Development Division.] October 22, 1943.
- 615 Centrifuge**
M1 Description of 1000-G centrifuge. [Allen S. Clarke.] [NBS, Ordnance Development Division.] November 25, 1942.
- 616 Propeller Unbalance Tester**
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M1 Proposed specifications for acceptance gauges to be used with M-2 and M-3 fuze components. Clarence B. Crane. [NBS, Ordnance Development Division.] December 3, 1942.
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- 620 Measurements**
- 621 Voltage**
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- 621.1 Tachometer**
- M1** Electronic tachometer. (Report No. OD-3-137.) Herbert D. Cook. NBS, Ordnance Development Division. April 28, 1944.
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- M2** A new proposal for shaking each unit in final test. (Report No. OD-BE-72R.) Wendell L. Lees. NBS, Ordnance Development Division. February 24, 1945.
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- 623 Compression**
- M1** Compression test equipment. (Report No. OD-4-50.) A. Chartock. NBS, Ordnance Development Division. April 27, 1944.
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- M1** Experimental measurement of the effect of an imperfect reflector on the induction field sensitivity of a radio proximity fuze. (Report No. OD-3-36.) Otto E. Spokas, Charles C. Gordon and Robert D. Huntoon. NBS, Ordnance Development Division. November 25, 1943.
- M2** Measurement of the reflection coefficient of the new bombing range at Aberdeen Proving Ground. (Report No. OD-3-90.) Otto E. Spokas. NBS, Ordnance Development Division. January 29, 1944.
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- M3** Determination of height of function of VT fuze. (Field Test Report No. 60.) John I. Gansert. OEMsr-769. State University of Iowa. August 22, 1945.
- 700 MISCELLANEOUS RESEARCH**
- 710 Powder Bag Fabrics**
- M1** Development of substitutes for silk in powder bags, as of December 31, 1941. (Memorandum No. A-32M.) Ralph T. Mease. NBS, Ordnance Development Division. February 5, 1942.
- M2** Effect of oxides of nitrogen on fabrics. (Memorandum No. A-35M.) Ralph T. Mease. Service Project No. NO-5. NBS, Ordnance Development Division. June 11, 1942.
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- 720 Range Finder Goggles**
- M1** Displaced-image range finder goggles. (Report No. OD-4-33.) William L. Whitson. NBS, Ordnance Development Division. February 14, 1944.
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- M2** [Ranging on shell bursts.] (File No. SC-S78-1, SONRD.) Lybrand Smith. US Navy Department October 24, 1941.
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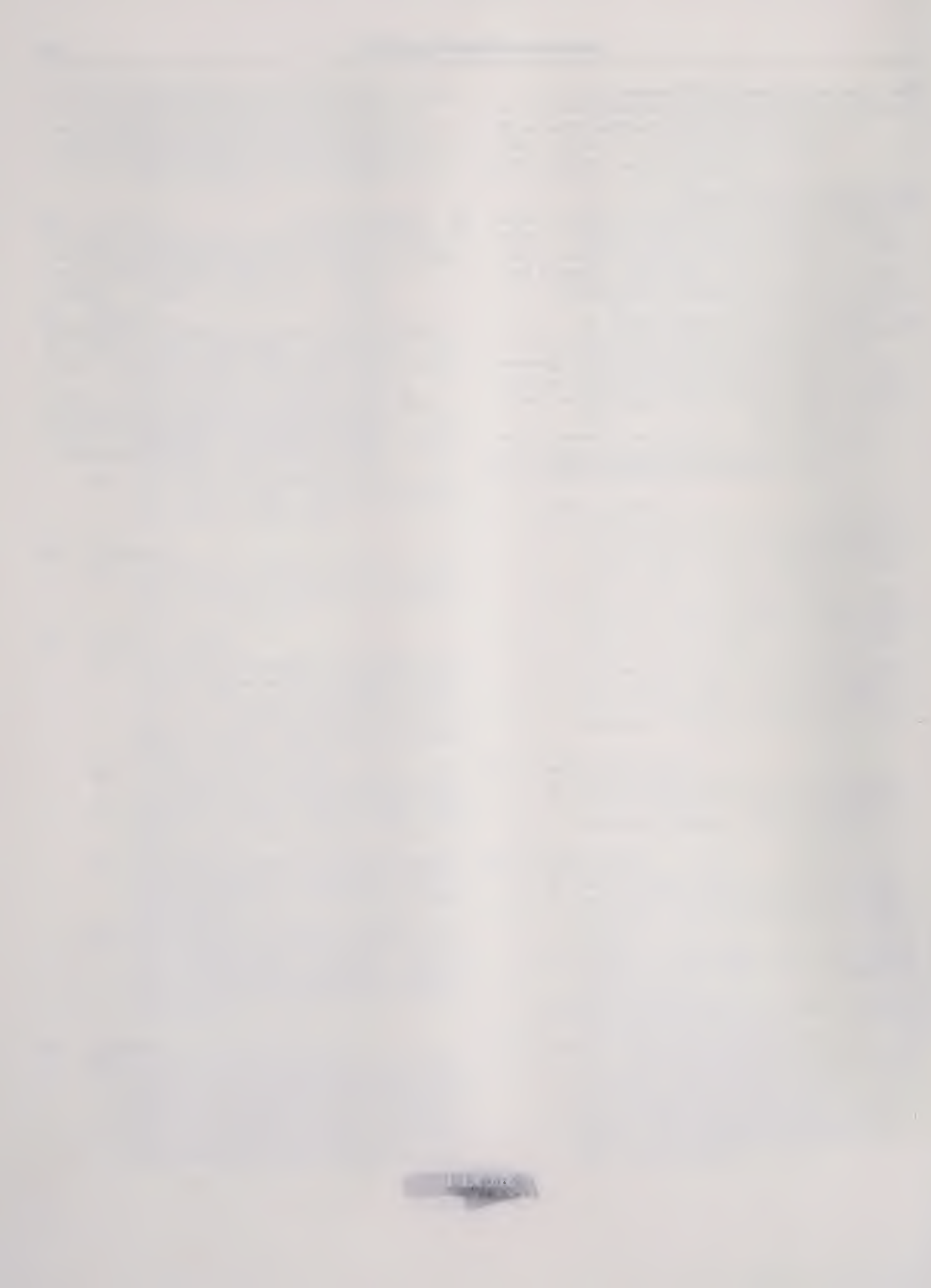
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- M2** Sequential analysis of statistical data. Applications. (Report No. OD-OAG-46.) T. N. White and H. C. Doob. (NBS, Ordnance Development Division.) September 27, 1944.
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100 AERODYNAMICS

- M1** Aerodynamics of aircraft bombs. (Volumes I and II.) Hugh L. Dryden. National Bureau of Standards. February 28, 1927.
- M2** Phorodromics. (Chapters I to III. Report No. SM-3536.) W. B. Klemperer. Douglas Aircraft Company, Inc. July 17, 1942.
- M3** Echodromics. Chapter I, Flight characteristics. (Report No. SM-3745.) W. B. Klemperer. Douglas Aircraft Company, Inc. Revised: December 31, 1942.

200 TYPES OF GUIDED MISSILES

210 Homing Glide Bombs

- M1** Analysis of the longitudinal stability of homing glide bombs with applications to Navy SWOD Mark 7 and Mark 9. Harold K. Skramstad. Service Project Nos. AC-1, NO-115 and others. National Bureau of Standards. October 15, 1945.
- M2** Representation of longitudinal stability and control of homing glide bombs by an electromechanical model. Harold K. Skramstad. Service Project Nos. AC-1, NO-115 and others. National Bureau of Standards. October 26, 1945.
- M3** An automatic pilot for homing glide bombs. John A. Hart. Service Project Nos. AC-1, NO-115 and others. National Bureau of Standards. (n.d.)

220 Roc (Medium-Angle Bomb)

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- M1** Echodromics. Chapter IV, Design of flight test bird, Roc-1. (Report No. SM-3745.) W. B. Klemperer. Douglas Aircraft Company, Inc. December 1, 1943.
- M2** Design and development of the Roc-00-1000, Serial Nos. 1 to 20. (Report No. SM-8349, covering the period of December 10, 1943 to April 26, 1945.) (n.a.) OEMsr-327; Service Project No. AC-36. Douglas Aircraft Company, Inc. June 15, 1945.
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- M2** Project Roc. Chapter VI, Functional tests [of] brood I-A, test birds with quadrant eyes. (Report No. SM-3745.) W. B. Klemperer. Douglas Aircraft Company, Inc. April 18, 1944.

- M3** Project Roc. Chapter VII, Brood I-B, test birds with Fairchild eyes. (Report No. SM-3745.) W. B. Klemperer. Douglas Aircraft Company, Inc. July 25, 1944.

- M4** Recording cameras. Joseph L. Boon. OEMsr-978. Eastman Kodak Company. September 9, 1944.

- M5** Tests of a $\frac{3}{4}$ -scale model of the NDRC Roc-00 missile. (Memorandum Report No. A-4K10.) Kenneth M. Hughes. November 10, 1944.

- M6** Flight tests of the Roc-00-1000V. Drops V-1 through V-21. (Report No. SM-8386, covering the period of June, 1944 to September, 1945.) (n.a.) OEMsr-327; Service Project No. AC-36; OSRD No. 6414. Douglas Aircraft Company, Inc. January 15, 1946.

- M7** Flight tests of the Roc-00-1000T. Drops T-1 through T-10. (Report No. RL-8387, covering the period of January 1 to December 31, 1945.) (n.a.) OEMsr-327; Service Project No. AC-36; OSRD No. 6610. Douglas Aircraft Company, Inc. February 25, 1946.

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- M1** Project Beetle. W. S. Leitch. OEMsr-1002. Bendix Aviation Corporation. October 13, 1943.

- M2** Special amplifier project. Control amplifiers for guided missiles. (Final Report No. RDE-13035-1.) W. S. Leitch. OEMsr-1002; Service Project No. AC-36. Bendix Aviation Corporation. January 30, 1946.

- M3** Experimental study of control techniques for television Roc. (Report No. RL-8385, covering the period of January, 1945 to February, 1946.) E. H. Pier. OEMsr-327; Service Project No. AC-36; OSRD No. 6562. Douglas Aircraft Company, Inc. February 25, 1946.

224 Roc Trainer

- M1** Theory and operation of television bomb MIMO simulator, Model I, with a general discussion of some electrical computation methods. (Final Report No. R-199, covering the period from August 1, 1945 to December 14, 1945.) A. Costa de Beauregard, George Bartholomei and others. OEMsr-1493; Service Project No. AC-36; OSRD No. 6396. Specialties, Inc. December 14, 1945.

230 High-Angle Dirigible Bomb

231 Theory and Development

- M1** Experimental investigations in connection with the

flight characteristics of bombs. (Progress Report No. 232.) T. B. Pepper. NDCrc-183. Gulf Research and Development Company. April 1, 1942.

M2 Development of a dirigible bomb. (Seventh Progress Report.) J. F. Hutzenlaub. OEMsr-240. Massachusetts Institute of Technology. April 15, 1943.

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311 Television Equipped

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- M4** Block equipment used in glider bombs, Eglin Field, Florida. (Field Service Report [for the period from] June 25, 1943 to July 7, 1943.) Robert W. Clark, Alfred E. Jackson and R. R. Davis. National Broadcasting Company, Inc. [July (?) 1943.]
- 312 Target Airplanes**
- M1** Improved radio control equipment for target airplanes. (Final Progress Report No. 340.) Richard C. Webb. OEMsr-278. Purdue University. December 1, 1942.
- 320 Radar Homing Control**
- M1** Radio set, RHB. Section I, Technical description of production model radio set RHB. (Section II, Adjustment and alignment of radio set RHB. (Division 14. Report No. 508-1.) Edited by: Elisabeth M. Lyman. OEMsr-262. MIT, Radiation Laboratory. January 17, 1944.
- M2** Developments in radar homing missiles for the period March 1, 1944 to May 1, 1945. (Sections I to IV.) R. A. Lamm, A. J. McLennan and P. R. Stout. OEMsr-240; Service Project Nos. NO-115, AC-36 and others. Massachusetts Institute of Technology. June 1, 1945.
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- 330 Heat-Homing Devices**
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- M1** [The heat-homing eye.] (Final Report covering period [from] March 1, 1944 to June 30, 1945.) (n.a.) OEMsr-1317; Service Project Nos. AC-36 and NO-257. Polaroid Corporation. August 15, 1945.
- 331 Scanning Devices**
- M1** A to-and-fro scanning device giving right-left control. Charles B. Aiken. OEMsr-921; Service Project No. AC-36. Electro-Mechanical Research, Inc. January 28, 1944.
- M2** The Fairchild wide-angle scanner. (n.a.) OEMsr-1182. Fairchild Camera and Instrument Corporation. May 24, 1944.
- M3** Heat sensitive devices employing to-and-fro scanning. (Report [covering period from] February 1, 1943 to May 31, 1945.) Charles B. Aiken, M. Lebourg and W. C. Welz. OEMsr-921; Service Project No. AC-36. Electro-Mechanical Research, Inc. September 20, 1945.
- 332 Bolometers**
- M1** Analysis of bolometer response to modulated energy, with applications to the design of to-and-fro scanning systems. Charles B. Aiken. OEMsr-921, Service Project No. AC-36. Electro-Mechanical Research, Inc. December 22, 1943.
- M2** The frequency characteristics of bolometers. Charles B. Aiken. OEMsr-921; Service Project No. AC-36. Electro-Mechanical Research, Inc. November 17, 1944.
- M3** Film-type bolometers. (Report [covering period from] February 1, 1943 to May 31, 1945.) Charles B. Aiken, William H. Carter, Jr. and F. S. Phillips. OEMsr-921; Service Project No. AC-36. Electro-Mechanical Research, Inc. August 13, 1945.
- M4** Metal strip bolometers. (Report covering period [from] March 1, 1944 to November 30, 1945.) Bruce Billings, Edgar Barr and Lewis Hyde. OEMsr-1317 and NOrd-6013; Service Project Nos. NO-257 and AC-36; OSRD No. 6397. Polaroid Corporation. March, 1946.
- 333 Flares**
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- M1** Colored flares. (Division 11.) G. Albert Hill and R. G. Clarke. OEMsr-321; Research Project No. PDRC-432; OSRD No. 4408-A. Wesleyan University. February 10, 1945.
- 340 Homing Devices Controlled by Birds**
- M1** The present status of the bird's eye bomb. B. F. Skinner, K. B. Breland and Norman Guttman. General Mills, Inc. February 1, 1943.
- M2** Characteristics of the response of the vacuum system unit. Philip Christopherson. OEMsr-1068. General Mills, Inc. January 7, 1944.
- M3** Cost of homing units. Personnel and organization required. Discussion and analysis. B. F. Skinner, E. E. Kuphal and others. General Mills, Inc. February 21, 1944.
- 350 Servomechanisms**
- M1** The analysis and synthesis of linear servomechanisms. (Division 7.) Albert C. Hall. Massachusetts Institute of Technology. May, 1943.
- M2** Development of a servocontrol system for guided missiles. (Preliminary Report covering the period from May 1, 1943 to March 15, 1945.) (n.a.) OEMsr-1013; Service Project Nos. NO-115 and AC-36. Massachusetts Institute of Technology. July 2, 1945.
- M3** Development of a servocontrol system for guided missiles. (Report covering period from March 15 to October 31, 1945.) (n.a.) OEMsr-1013; Project Nos. NO-115, AC-36 and MIT Research Project DIC-6168; OSRD No. 6418. Massachusetts Institute of Technology. October 31, 1945.
- M4** The development of servocontrol mechanisms for homing aero-missiles. Emmett C. Bailey and Wesley G. Spangenberg. Service Project Nos. AC-1, NO-115 and others. National Bureau of Standards. (n.d.)

360 Miscellaneous Devices

- M1** Detector systems for interference reducing radio systems. E. S. Purington. OEMsr-694. Hammond Research Corporation. May 17, 1943.
- M2** An antirotational stabilizer. (Report covering period from February 1, 1943 to May 31, 1945.) H. G. Doll, G. K. Miller and Charles B. Aiken. OEMsr-921; Service Project No. AC-36. Electro-Mechanical Research, Inc. September 15, 1945.

400 AIRBORNE TELEVISION TRANSMITTING EQUIPMENT

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- 120 **Industrial Research Laboratories**
- 121 **Bell Telephone Laboratories**

121.1	Contract OEMsr-346 M1 Final technical report [under] Contract No. OEMsr-346. (n.a.) OEMsr-346; Section No. 6.1-sr346-1333. BTL. August 24, 1945.	200	OPERATIONS RESEARCH
121.2	Contract OEMsr-352 M1 Magnetic tape compensator. (n.a.) OEMsr-352; OSRD No. 688; Section No. C4-sr352-088. BTL. April 30, 1942.	201	Search and Screening M1 Probable effectiveness of antisubmarine attacks. Choice of size and type of antisubmarine bar-rages. L. B. Slichter. [OEMsr-20;] Section No. C4-sr20-054. CUDWR. January 19, 1942. M2 Antisubmarine searching plans. Chaim L. Pekeris and Patrick M. Hurley. [OEMsr-20;] Section No. C4-sr20-184. CUDWR. August 6, 1942. M3 Naked eye spotting of low-flying aircraft from the ground by day. K. J. W. Craik, J. M. Mitchison and S. J. Macpherson. Medical Research Council [Great Britain]. October 17, 1943. M4 Visual sightings of U-boats in theory and practice. (ORS/CC/Report No. 283.) [E. S. Lamar and G. W. Robertson.] Royal Air Force, Coastal Command, Operational Research Section [Great Britain]. April 3, 1944. M5 Minutes and proceedings of the twelfth meeting of the Army, Navy [and] OSRD Vision Committee. (n.a.) National Academy of Sciences. June 12, 1945. M6 Minutes and proceedings of the twelfth meeting of the Army, Navy [and] OSRD Vision Committee. (Supplement.) (n.a.) National Academy of Sciences. July 12, 1945. M7 Naked eye scanning by day, with special reference to observation from coastal command aircraft. K. J. W. Craik and S. J. Macpherson. Cambridge University [Great Britain]. (n.d.) M8 The visibility of aircraft in relation to camouflage. (ORS/CC/Report No. 151.) W. R. Merton. OSRD Liaison Office No. WA-941-16b(2). Royal Air Force, Coastal Command, Operational Research Section [Great Britain]. (n.d.)
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- M1** An abbreviated procedure for the determination of audiograms in the selection of sound operators. William D. Neff. NLL. 1942.
- M2** The validity of certain tests for the selection of sound operators. (n.a.) [Division 6.] March 6, 1942.
- M3** The selection and training of sound operators. William D. Neff. NLL. July 7, 1942.
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- M6** Selection of elementary sound material students. Some problems and some results. Robert L. French. NLL. December 22, 1942.
- M7** Instructions for the propeller noise discrimination meter. (Report No. P61/R1293.) Robert T. Zern. NLL. January 6, 1944.
- M8** The University of California, Division of War Research, Pitch-Memory Selection Test. A report on design standards. (Report No. U-196.) Adelbert Ford. OEMsr-30; Section No. 6.1-sr30-1413. UCDWR. March, 1944.
- M9** Revised selection procedure for sonar operators. A report on validating research. (Report No. U-197.) Adelbert Ford, Stanley W. Osgood and others. OEMsr-30; Section No. 6.1-sr30-1414. UCDWR. March, 1944.
- M10** A survey of 4003 audiograms in relation to the performance of sonar operators at the West Coast Sound School. (Report No. G-42.) Adelbert Ford. UCDWR. April, 1944.
- M11** Tryout of the propeller noise discrimination meter at the West Coast Sound School. (Report No. P61/R1378.) Stanley W. Osgood. NLL. February 28, 1945.
- M12** Tryout of the target discrimination test records at the West Coast Sound School. (Report No. P61/R1383.) Stanley W. Osgood. NLL. February 28, 1945.
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- M1** The selection of sound officers and antisubmarine warfare officers. (Report No. G42/TG192.) (n.a.) NLL. September 9, 1943.
- M2** Selection research on sonar officers. Technical report on validation studies. (Report No. M-235.) Adelbert Ford, Stanley W. Osgood and others. Service Project No. NS-97. UCDWR. June, 1944.
- M3** The Relative Movement Test in sonar officer selection. (Report No. M-245.) (n.a.) Service Project No. NS-97. UCDWR. August 5, 1944.
- 320 Training of Personnel and Training Devices**
- 321 Antisubmarine Warfare Sonar Operators**
- 321.1 Bearing Teachers**
- M1** Service manual for NDRC bearing teacher. (n.a.) RCA. [1942(?)]
- M2** Primary bearing teacher. Henry E. Hartig, Firth Pierce and George A. Brettell, Jr. OEMsr-30; OSRD No. 1063; Section No. C4-sr30-393. UCDWR. November 5, 1942.
- M3** Advanced bearing teacher. (Report No. U-18.) Henry E. Hartig, Firth Pierce and George A. Brettell, Jr. OEMsr-30; Section No. 6.1-sr30-409. UCDWR. January 2, 1943.
- M4** Instructor's manual for use with the primary bearing teacher. (n.a.) OEMsr-30. UCDWR. May 1, 1943.
- M5** Instructor's manual for the advanced bearing teacher. (Report No. U-69.) (n.a.) OEMsr-30. UCDWR. June 8, 1943.
- M6** Midget bearing demonstrator. (Report No. M-256.) Karl F. Sommermeyer. OEMsr-30; Service Project No. NS-97. UCDWR. September 14, 1944.
- 321.2 Bearing Deviation Indicator (BDI)**
- 321.21 Trainers**
- M1** Bearing deviation indicator trainer. (Report No. U-218.) Clark F. Bradley. OEMsr-30; Section No. 6.1-sr30-1517. UCDWR. May 23, 1944.
- M2** Operating training equipment, Models 2 and 10. (n.a.) OEMsr-287; Section No. 6.1-sr287-1555. HUSL. June 20, 1944.
- M3** Bearing deviation indicator training aid. Operator training equipment, Model 8, for use with Radio Corporation of America advanced bearing teacher, Type QFD. Neil E. Handel, Benjamin A. Wooten and Dwight E. Gray. OEMsr-287; OSRD No. 4156; Section No. 6.1-sr287-1787. HUSL. September 5, 1944.
- M4** Operator training equipment, Models 2 and 10. (n.a.) OEMsr-287; Section No. 6.1-sr287-2055. HUSL. January 1, 1945.
- M5** Operator training equipment, Model 8, bearing deviation indicator adapter for QFD. (n.a.) OEMsr-287; OSRD No. 5208; Section No. 6.1-sr287-2063. HUSL. May 15, 1945.
- 321.22 Maintenance**
- M1** Installation and maintenance manual for bearing deviation indicator unit, Model X-3. (n.a.) HUSL. October 1, 1943.
- M2** Bearing deviation indicator dynamic demonstrator. Charles R. Rutherford, Benjamin A. Wooten and

Dwight E. Gray. OEMsr-287; Section No. 6.1-sr287-1557. HUSL. June 15, 1944.

M3 Operator training equipment, Model 9, bearing deviation indicator signal generator. (n.a.) OEMsr-287; Service Project No. NS-142; OSRD No. 5008; Section No. 6.1-sr287-2064. HUSL. April 1, 1945.

M4 Bearing deviation indicator dynamic demonstrator. (n.a.) OEMsr-287; Service Project No. NS-142; Section No. 6.1-sr287-2066. HUSL. June 30, 1945.

321.3 Group Operator Trainer

M1 Preliminary instruction manual for the group operator trainer. (Report No. M-376.) (n.a.) NObs-2074. UCDWR. February 8, 1946.

321.4 Echo Recognition Group Trainer

M1 Echo recognition group training as developed for use with the echo recognition monitor recorder, Model 2. (Report No. U-325.) (n.a.) NObs-2074. UCDWR. July 10, 1945.

321.5 Artificial Projector Maintenance

M1 Inductive echo simulator. O. Hugo Schuck. OEMsr-287; Section No. 6.1-sr287-901. HUSL. June 28 1943.

M2 Projector simulator coil development aims. O. Hugo Schuck. HUSL. February 2, 1944.

M3 Projector simulator coil development aims. (Continued from memorandum of February 2, 1944.) O. Hugo Schuck. HUSL. February 10, 1944.

M4 Spherical-shaped artificial projectors. John O. Hancock. HUSL. March 17, 1944.

M5 Operational testing and training equipment project aims. O. Hugo Schuck. HUSL. March 26, 1944.

M6 Artificial projector. John O. Hancock and O. Hugo Schuck. HUSL. May 23, 1944.

M7 Lag line for artificial projector. John O. Hancock. HUSL. July 26, 1944.

M8 Artificial projector, Testing of O. Hugo Schuck and John O. Hancock. HUSL. September 23, 1944.

M9 Artificial projector. O. Hugo Schuck, John O. Hancock and Benjamin A. Wooten. OEMsr-287; Section No. 6.1-sr287-1786. HUSL. November 1, 1944.

M10 Instruction manual for artificial projector. (n.a.) HUSL. December 1, 1944.

M11 Artificial QC projector, Model 3. William C. Kraft. HUSL. May 8, 1945.

M12 Artificial sonar projector. (n.a.) OEMsr-287; OSRD No. 6080; Section No. 6.1-sr287-2054. HUSL. September 1, 1945.

321.6 JP-1 Training Program

M1 Neil Handel on operational testing equipment. Neil E. Handel. HUSL. October 5, 1943.

M2 Instructor's manual for the JP-1 training program. (Report No. P50/R1197.) (n.a.) OEMsr-

1128; Service Project No. N-118. NLL. November 2, 1944.

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322.1 Recorder Trainers

M1 The West Coast Sound School training program for the tactical sound range recorder teacher, Navy QFL. (Report No. U-190.) William L. Jenkins. Section No. 6.1-sr30-1470. UCDWR. March, 1944.

M2 Preliminary installation, adjustment and maintenance instructions for Model QFL, tactical range recorder teacher. (Report No. P21/R533.) (n.a.) NLL. May 8, 1944.

M3 Recorder trace projector. RQ-10310 recorder projector assembly. (Report No. P39/R711.) Cecil E. Walton. OEMsr-1128; Service Project No. NS-97; Section No. 6.1-sr1128-1571. NLL. August 14, 1944.

M4 Model QFL, tactical range recorder teacher. (Report No. P21/R1402.) William L. Jenkins. OEMsr-1128; Service Project No. NS-97; OSRD No. 5073; Section No. 6.1-sr1128-1943. CUDWR. May 9, 1945.

322.2 Conning Teacher

M1 A conning teacher. William E. Stephens. UCDWR. August 29, 1942.

M2 Installation, operation and maintenance instructions for Model QFH underwater sound equipment, Type CAN-55117 conning teacher. (n.a.) NXss-29059. Sangamo Electric Company. June, 1943.

M3 Primary conning teacher. (Report No. U-89.) A. W. Mellon. OEMsr-30; OSRD No. 1845; Section No. 6.1-sr30-681. UCDWR. August 14, 1943.

M4 Instructor's manual for Model QFH sound training equipment, conning teacher. (Edition B. Report No. R-192.) (n.a.) Service Project No. NS-97. UCDWR. [March, 1944.]

M5 Conning officer attack teacher. (Report No. P40/R1147.) Glenn D. Gillett. Service Project No. NS-257. NLL. September 23, 1944.

M6 Preliminary installation, operation and maintenance instructions for the modified Mark I conning officer attack teacher, COAT. (Report No. P40/R1156.) (n.a.) NLL. February 15, 1945.

M7 Modification of the Mark I conning officer attack teacher. (Report No. P40/R1227.) Glenn D. Gillett, Harold I. Hultgren and Nelson W. Rodelius. OEMsr-1128; Service Project Nos. N-118 and NO-226; Section No. 6.1-sr1128-1583. NLL. February 19, 1945.

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M1 Practice attack meter. (n.a.) OEMsr-346; OSRD No. 1367; Section No. 6.1-sr346-830. BTL. March 25, 1943.

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M2 Preliminary instruction book for depth charge pattern recorder, Mark I, Model 0 Installation, operation and maintenance. (Report No. R-173.) (n.a.) Service Project No. NO-195; OSRD No. 3759; Section No. 6.1-sr30-1680. UCDWR. May, 1944.

M3 Echo injector. (Report No. U-302.) Karl Sommermeyer. NObs-2074. UCDWR. March 1, 1945.

M4 Preliminary instruction book for the assisting ship projector, Model I. (Report No. M-373.) (n.a.) NObs-2074; Service Project No. NS-97. UCDWR. January 21, 1946.

323.1 Classroom Attack Teachers

M1 Installation, operation and maintenance instruction book for underwater sound attack teacher, Models QFA and QFA-1. (n.a.) NOs-94981. Sangamo Electric Company. December 6, 1941.

M2 Bearing deviation indicator training aid for use with Sangamo attack teacher. (n.a.) OEMsr-287; OSRD No. 3104; Section No. 6.1-sr287-1340. HUSL. December 22, 1943.

M3 Bearing deviation indicator training aid for use with Sangamo attack teacher, QFA-3. (n.a.) Section No. 6.1-sr287-1440. HUSL. February 21, 1944.

M4 Operator training equipment, Model 4. (n.a.) OEMsr-287; OSRD No. 4932; Section No. 6.1-sr287-2059. HUSL. March 1, 1945.

323.2 Shipboard Antisubmarine Attack Teacher (SASAT)

M1 A device for obtaining bearing and range rate to be used as an auxiliary to SASAT A. (Report No. M-82.) Carl Eckart. UCDWR. July 15, 1943.

M2 The SASAT slide rule. (Report No. U-90.) Gaylord P. Harnwell and Leonard I. Schiff. OEMsr-30; OSRD No. 1932; Section No. 6.1-sr30-682. UCDWR. August 13, 1943.

M3 Shipboard antisubmarine attack teacher, SASAT A. (Report No. U-93.) Clark F. Bradley. OEMsr-30; OSRD No. 1933; Section No. 6.1-sr30-684. UCDWR. August 30, 1943.

M4 Preliminary instruction manual for the shipboard antisubmarine attack teacher, SASAT A. (Report No. R-94.) Clark F. Bradley and James M. Snodgrass. UCDWR. August 31, 1943.

M5 WEA-1 and WEA-2 adapters for SASAT. (Report No. U-121.) Clark F. Bradley. UCDWR. October 22, 1943.

M6 Installation, operation and maintenance instruction book for Navy Model QFK shipboard sound operator trainer. (n.a.) NXss-30773. UCDWR and Stoddart Aircraft Radio Company. January, 1944.

M7 Shipboard antisubmarine attack teacher, SASAT B. (Report No. U-186.) Firth Pierce and Jay Schisel. OEMsr-30; OSRD No. 3442; Section No. 6.1-sr30-1402. UCDWR. February 25, 1944.

M8 Instructor's manual for the Model QFK shipboard

sound operator trainer. (Report No. R-191.) (n.a.) OEMsr-30. UCDWR. March, 1944.

M9 Shipboard antisubmarine sonar trainer, SASAT A, Model V. (Report No. U-211.) Edward G. Smuckler. OEMsr-30; Section No. 6.1-sr30-1511. UCDWR. May 5, 1944.

323.3 Practice Targets

M1 Experimental underwater towed model echo repeater. Edwin M. McMillan, William A. Meyers and David J. Evans. Section No. C4-sr30-515. UCDWR. September 1, 1942.

M2 Echo repeater target, Surface Model RR-1. (Report No. U-1.) Edwin M. McMillan, David J. Evans and William A. Meyers. OEMsr-30; Section No. C4-sr30-399. UCDWR. November 12, 1942.

M3 Operation, maintenance and installation instructions for Surface Model RR-1 practice target. (Report No. U-15.) (n.a.) Service Project No. NS-97. UCDWR. December 14, 1942.

M4 Towed submerged antisubmarine practice target, Model SR-2. (Report No. U-42.) David J. Evans, T. Finley Burke and Donald G. Reed. Service Project No. NS-144; Section No. 6.1-sr30-736. UCDWR. February 25, 1943.

M5 Antisubmarine practice target, Keel Model KP-1. (Report No. U-45.) David J. Evans and Donald G. Reed. Service Project No. NS-144. UCDWR. February 25, 1943.

M6 Preliminary instruction book for Model SR-2 antisubmarine practice target equipment. Installation, operation and maintenance manual. (Report No. U-64.) (n.a.) Service Project No. NS-144. UCDWR. May 14, 1943.

M7 Preliminary instruction book for Model BR-1 antisubmarine practice target equipment with the Model S1-AB amplifier. Installation, operation and maintenance manual. (Report No. U-70.) (n.a.) Service Project No. NS-144. UCDWR. June 2, 1943. pp. 15-16.

M8 Preliminary instruction book for Model BR-1 antisubmarine practice target equipment with the Model S3-AB amplifier. Installation, operation and maintenance manual. (Report No. U-71.) (n.a.) Service Project No. NS-144. UCDWR. June 11, 1943. pp. 15-16.

M9 Supplementary notes on: Preliminary instruction book for Model BR-1 antisubmarine practice target with the Model S3-AB amplifier. (Report No. U-71a.) (n.a.) UCDWR. September 16, 1943. pp. 1-3.

M10 Instruction book for Model SR-5 practice target, Navy Model OAT. Installation, operation and maintenance manual. (Report No. R-142.) (n.a.) Service Project No. NS-144. UCDWR. January, 1944.

M11 Supplementary instruction book for antisubmarine practice targets. (Report No. R-200.) (n.a.) Serv-

ice Project No. NS-144; OSRD No. 3806; Section No. 6.1-sr30-1684. UCDWR. April, 1944.

324 Submarine Sonar Operators

- M1** Training equipment for submarine personnel. (Report No. G11/R913.) (n.a.) NLL. May 6, 1944.
- M2** Instructor's handbook for the noise level monitor trainer. (Report No. 4E/M2.) (n.a.) CUDWR. [1945 (?)]
- M3** ComSubsLant sonar. Radar training barge. (Report No. P63/R1414.) George M. Gourley. NLL. February 28, 1945.
- M4** Preliminary instruction book for the sound recognition group trainer. (Report No. M-342.) (n.a.) NObs-2074. UCDWR. July 20, 1945.
- M5** Preliminary instruction manual for the group listening teacher, Model CXKG, WCA portion. Operation, installation and maintenance. Part I, Text. Part II, Illustrations. (Report No. M-380.) (n.a.) NObs-2074. UCDWR. March 15, 1946.

325 Submarine Officers

- M1** Submarine barometer simulator. (Report No. M-270.) (n.a.) OEMsr-30. UCDWR. October 28, 1944.

325.1 Periscope Trainers

- M1** General specification for [the] periscope trainer. (Report No. P41/R841.) (n.a.) Service Project No. NS-97. NLL. July 11, 1944.
- M2** Periscope trainer manual. (Report No. P41/R1325.) (n.a.) Service Project No. N-118. NLL. February 5, 1945.
- M3** Periscope trainer. (Report No. P41/R1420.) Joseph A. Barkson. Service Project No. N-118; OSRD No. 5233; Section No. 6.1-sr1128-2213. NLL. May 21, 1945.
- M4** Shipboard submarine periscope attack teacher. [Gaylord P. Harnwell.] UCDWR. (n.d.)

325.2 Bathythermograph Trainers

- M1** The bathythermograph simulator. (Report No. U-360.) (n.a.) NObs-2074. UCDWR. September 13, 1945.
- M2** Submarine bathythermograph classroom demonstrator. (Report No. M-363.) (n.a.) NObs-2074. UCDWR. September 20, 1945.

326 Miscellaneous Trainers

- M1** The range indicator trainer. (Report No. M-381.) (n.a.) NObs-2074. UCDWR. December 11, 1945.

326.1 Operational Bearing Recorders

- M1** Operational bearing recorder. (n.a.) OEMsr-287; OSRD No. 3562; Section No. 6.1-sr287-1454. HUSL. April 10, 1944.
- M2** Operational bearing recorder. (n.a.) OEMsr-287; Service Project No. NS-97; Section No. 6.1-sr287-2065. HUSL. March 1, 1945.

326.2 Animated Trainers

- M1** Instructor's pamphlet for the bearing indicator animated trainer. (Report No. P47/R937.) (n.a.) NLL. July 1, 1944.
- M2** Instructor's pamphlet for the relative bearing animated trainer. (Report No. P47/R936.) (n.a.) NLL. July 1, 1944.
- M3** Instructor's pamphlet for the IS-WAS animated trainer. (Report No. P47/R1000.) (n.a.) NLL. July 10, 1944.
- M4** Animated trainers, BIAT, RBAT [and] IS-WAS-AT. (Report No. P47/R1193.) Glenn D. Gillett and Nelson W. Rodelius. Service Project No. NS-118; Section No. 6.1-sr1128-1598. NLL. October 31, 1944.

326.3 Radio Sonic Buoy Trainers

- M1** Recorded water noise for the directional radio sonic buoy trainer. (Report No. P52/R945.) Glenn D. Gillett. Service Project No. NS-106. NLL. May 29, 1944.
- M2** Synchro requirements for attack teachers, etc. (Report No. P40/P52/R955.) Glenn D. Gillett. NLL. June 7, 1944.
- M3** Filter and mixer unit for the directional radio sonic buoy trainer. (Report No. P52/R1037.) Robert T. Zern. NLL. July 21, 1944.
- M4** Report on training activities. Part 1, Expendable radio sonic buoy. Part 2, Directional radio sonic buoy. (Report No. P52/R1142 [covering period from] April 1, 1944 [to] September 1, 1944.) (n.a.) NLL. September 25, 1944.
- M5** Directional radio sonic buoy trainer. (Report No. P52/R1335.) Joseph A. Barkson. Service Project No. NS-106; OSRD No. 5095; Section No. 6.1-sr1128-1947. NLL. May 1, 1945.

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- M1** [Magnetic airborne detection equipment.] Annual report [for] 1942 by Operations and Installation Department. (n.a.) AIL. 1942.
- M2** [Magnetic airborne detection.] Annual report [for] July 1, 1942 [to] August 31, 1943. (n.a.) AIL. October 1, 1943.
- M3** Magnetic airborne detection equipment. (n.a.) OEMsr-1129; OSRD No. 5486; Section No. 6.1-sr1129-1773. AIL. July 15, 1945.

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- M1** Magnetic airborne detection performance data during operation of VP-91 at Kaneohe Bay, Oahu, T. H., August 14 [to] September 4, 1943. Winfield E. Fromm. CUDWR. September 11, 1943.
- M2** VP-91, August 18 to September 13, 1943. Walter E. Tolles. AIL. September 25, 1943.
- M3** Trip to Kaneohe Bay, Oahu, T. H., with VP-91. Walter E. Tolles. AIL. September 25, 1943.

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- M4** U-boat contact and attack by VP-63, February 24, 1944. Edmond W. Westrick. AIL. April 1, 1944. 414
- 410 Saturated Core Magnetometers**
- M1** Saturated core magnetometers. Walter H. Brattain. AIL. July 14, 1943.
- M2** Saturated core magnetometers. (n.a.) OEMsr-1129; Service Project No. NA-120; OSRD No. 5314; Section No. 6.1-sr1129-1772. AIL. May 16, 1945.
- 411 Theory**
- M1** Derivatives of a dipolar field. (Technical Memorandum No. 5.) Norman A. Haskell. CUDWR. September 16, 1941.
- M2** A graphical explanation of the behavior of the saturated core magnetometer. Franklin L. Furst. AIL. September 28, 1943.
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- M2 A slide rule to facilitate buoyancy computations. (Technical Report No. 5.) (n.a.) Scripps Institution of Oceanography. January 29, 1945.
- M3 Vertical buoyancy differences due to salinity in the Yellow and East China Seas. (Technical Report No. 8.) (n.a.) Scripps Institution of Oceanography. February 20, 1945.
- M4 A method for determination of the relative subsurface currents from profiles of relative buoyancy. (Technical Report No. 13.) (n.a.) Scripps Institution of Oceanography. May 12, 1945.
- M5 Methods employed in the construction of average buoyancy charts for the submarine supplements. (Technical Report No. 12.) (n.a.) Scripps Institution of Oceanography. May 19, 1945.

501.322 Density

- M1 Instruments for measuring density of sea water from submarines. (n.a.) [WHOI.] [October 29, 1942.]
- M2 The use of a density meter as an aid to submarine diving. Alfred C. Redfield and Allyn C. Vine. Section Nos. 6.1-sr31-427, -430. WHOI. December 11, 1942.
- M3 Submarine densitometers. (n.a.) WHOI. November 9, 1943.
- M4 Density gradients in the Northwestern Pacific, August. (Technical Report No. 6.) (n.a.) Scripps Institution of Oceanography. January 23, 1945.

501.4 Internal Waves

- M1 Internal waves. (Bi-monthly summary of projects for Division 6, as of October 1, 1944.) (n.a.) Section No. 6.1-NDRC-1852. Division 6. November, 1944. pp. 31-33.
- M2 Internal waves. (Bi-weekly Report No. U-285, covering period from December 10 [to] December 23, 1944.) (n.a.) Section No. 6.1-sr30-2014. UCDWR. December 27, 1944. p. 12.

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- M3** Internal waves. (Bi-weekly Report No. U-297, covering period from January 21 to February 3, 1945.) (n.a.) Section No. 6.1-sr30-2025. UCDWR. February 10, 1945. p. 6.
- M4** Internal waves. (Bi-monthly summary of projects for Division 6, as of February 1, 1945.) (n.a.) Section No. 6.1-NDRC-1859. Division 6. March, 1945. p. 29.
- M5** Thermal investigations. Series I, Sonar data. (Monthly Progress Report No. MR-316-I for April, 1945.) (n.a.) NObs-2074. UCDWR. April, 1945. p. 11.
- 510 Transmission**
- M1** Sound transmission in sea water. (Report No. G1/1184.) (n.a.) WHOI. February 1, 1941.
- 510.1 Theory**
- M1** Factors affecting long distance sound transmission in sea water. A study of radio acoustic ranges from data taken by the US Coast and Geodetic Survey. George P. Woollard. OEMsr-31; OSRD No. 1505; Section No. 6.1-sr31-426. WHOI. March 30, 1943.
- M2** Echo ranging at lower frequencies. (Interim Report No. U-109.) L. M. Langer. OEMsr-30; OSRD No. 1954; Section No. 6.1-sr30-1114. UCDWR. September 1, 1943.
- M3** Solution of acoustic boundary problems. (Parts I to III.) Leonard I. Schiff. University of Pennsylvania. September 4, October 7 and November 2, 1943.
- M4** Long range sound transmission. (Interim Report No. 1 for the period March 1, 1944 to January 20, 1945.) Maurice Ewing and J. Lamar Worzel. NObs-2083. WHOI. August 25, 1945.
- 510.11 Sound Waves**
- M1** The extinction of sound in water. Carl F. Eckart. Section No. C4-sr30-021. UCDWR. August 31, 1941.
- M2** Propagation of sound in a medium of variable velocity. Chaim L. Pekeris. Section No. C4-20-001. NLL. September 29, 1941.
- M3** Calculation of sound ray paths in sea water. Theory, tables and description of a slide rule for computation of limiting echo ranges and construction of sound ray diagrams from bathythermograph observations, with examples. Richard H. Fleming and Roger Revelle. UCDWR. January 16, 1942.
- M4** Some characteristics of the sound field in the sea. (n.a.) OSRD No. 546; Section No. C4-sr30-083. UCDWR. March 13, 1942.
- M5** Variation of the sound field near the surface in deep water. (Report No. U-49.) H. T. O'Neil and T. F. Johnston. OEMsr-30. UCDWR. March 16, 1943.
- M6** Theory of diffraction of sound in the shadow zone. Chaim L. Pekeris. OEMsr-20; Section No. 6.1-sr20-846. CUDWR. May 5, 1943.
- M7** Some theoretical studies of the propagation of sound in shallow water. (Report No. U-102.) Glen D. Camp and Carl F. Eckart. Section No. 6.1-sr30-1208. UCDWR. August 15, 1943.
- M8** The sonic ray plotter. (Report No. U-246.) Leonard I. Schiff. OEMsr-30; Service Project No. NS-140; Section No. 6.1-sr30-1741. UCDWR. August 8, 1944.
- M9** Sound beam patterns in sea water. (n.a.) OEMsr-31; Section No. 6.1-sr31-1730. WHOI. October 10, 1944.
- M10** Variation of signal amplitude after transmission in the sea. Malcolm H. Hebb and Nelson M. Blachman. HUSL. December 19, 1944.
- 510.111 Lloyd Mirror Effect**
- M1** Lloyd mirror effect in a variable velocity medium. (Report No. M-140.) Richard R. Carhart. UCDWR. October 23, 1943.
- 510.12 Explosion Waves**
- M1** Theory of the pulsations of the gas bubble produced by an underwater explosion. Conyers Herring. OSRD No. 236; Section No. C4-sr20-010. CUDWR. October, 1941.
- M2** Explosions. Propagation in linear case. Harry Nyquist. [Division 6.] October 31, 1941.
- M3** Pressure-time curves for submarine explosions. (Report No. RC-333.) W. G. Penney and H. K. Dasgupta. OSRD Liaison Office No. WA-273-54. Ministry of Home Security, Research and Experiments Department [Great Britain]. [July 23, 1942.]
- M4** Note on the possible existence of negative shock fronts. (Report No. AUW/TRI-68/RP-21.) H. N. V. Temperley and J. Craig. Admiralty Under Works, Rosyth [Great Britain]. August, 1944.
- M5** Theory of propagation of explosive sound in shallow water. Chaim L. Pekeris. OEMsr-1131; OSRD No. 6545; Section No. 6.1-sr1131-1891. CUDWR. January, 1945.
- 510.2 Measurements**
- M1** Attenuation of underwater sound. Frederick A. Everest and H. T. O'Neil. OEMsr-30; Section No. C4-sr30-494. UCDWR. Revised: July 30, 1942.
- M2** Some shallow water sound propagation measurements in the Thirteenth Naval District. (Report No. M-126.) (n.a.) Service Project Nos. NS-140 and NS-163; Section No. 6.1-sr30-1317. UCDWR. October 26, 1943.
- M3** Transmission of continuous sound. (Bi-weekly Report No. U-176, covering period from January 23 to February 5, 1944.) (n.a.) Service Project No. NS-140; Section No. 6.1-sr30-1233. UCDWR. February 11, 1944. pp. 9-12.
- M4** Some experiments on the transmission of continuous sound in 100-fathom to 600-fathom water. (Report No. M-193.) (n.a.) OEMsr-30; Service Project No. NS-140; Section No. 6.1-sr30-1842. UCDWR. March 15, 1944.

- M5** Transmission survey, Block Island Sound. (Report No. D12/R616.) William B. Snow, Henry B. Hoff and Jordan J. Markham. OEMsr-1128; Section No. 6.1-sr1128-1027. NLL. March 16, 1944.
- M6** Some sound propagation measurements in the Fourteenth Naval District. (Report No. M-228.) (n.a.) OEMsr-30; Service Project No. NS-140; Section No. 6.1-sr30-1691. UCDWR. June 19, 1944.
- M7** Transmission measurements in the vicinity of San Diego, California. (Report No. D12F/R822.) William B. Snow, Henry B. Hoff and Jordan J. Markham. OEMsr-1128; Service Project No. NO-163; Section No. 6.1-sr1128-1574. NLL. September 20, 1944.
- M8** Operational procedure and equipment used in sonar sound field studies. (Report No. U-295.) (n.a.) OEMsr-30; Service Project No. NS-140; Section No. 6.1-sr30-2024. UCDWR. February 15, 1945.

510.21 Sonic Sound Waves

- M1** Sound transmission measurements made off San Diego from August 31 to September 10, 1943. (n.a.) OEMsr-1046; Service Project Nos. NS-140, NS-164 and MIT Research Project DIC-6187; Section No. 6.1-sr1046-1047. MIT. February 10, 1944.
- M2** Transmission of underwater sound at lower frequencies. (Interim Report No. U-362.) (n.a.) NObs-2074. UCDWR. November 1, 1945.

510.22 Supersonic Sound Waves

- M1** Transmission of sound in sea water. Absorption and reflection coefficients and temperature gradients. (Report No. S-1204.) E. B. Stephenson. NRL. October 16, 1935.
- M2** Attenuation of sound in sea water. (Report No. PS-162.) G. J. Thiessen. OSRD Liaison Office No. III-I-830. National Research Council, Division of Physics and Electrical Engineering, Canada. June 10, 1943(?).
- M3** The sound field of echo-ranging gear. (Interim Report No. U-113.) (n.a.) OEMsr-30; OSRD No. 2011; Section No. 6.1-sr30-1206. UCDWR. October 1, 1943.
- M4** The attenuation of sound in the sea. (Report No. U-236.) Carl F. Eckart. OEMsr-30; Service Project No. NS-140; Section No. 6.1-sr30-1532. UCDWR. July 6, 1944.
- M5** A comparison of calculated and observed intensities of some split beam sound field runs. (Internal Report No. A-26.) Richard R. Carhart and L. A. Thacker. UCDWR. August 2, 1944.
- M6** An acoustic interferometer for the measurement of sound velocity in the ocean. (Report No. S-18.) Robert J. Urick. NRSL. September 18, 1944.
- M7** Reverberation and scattering. Series I, Sonar data. (Monthly Progress Report No. MR-365-I [for] Sep-

tember, 1945.) (n.a.) NObs-2074. UCDWR. September, 1945. pp. 4-6.

510.221 Shallow Water

- M1** Transmission of 24-kc and 60-kc sound in very shallow water, June, 1944. (Internal Report No. A-31.) M. J. Sheehy. UCDWR. August 26, 1944.
- M2** Transmission of 24-kc and 60-kc sound in very shallow water, October, 1944. (Internal Report No. A-31a.) M. J. Sheehy. UCDWR. October 23, 1944.
- M3** The short range spatial pattern measurements on the JK-SK4926 transducer at 24 kc. (Internal Report No. A-52.) N. Most. UCDWR. January 5, 1945.
- M4** Transmission of 24-kc sound in shallow water. (Report No. M-368.) (n.a.) NObs-2074. UCDWR. November 20, 1945.
- M5** The additive effects of wind force, thermal gradient and particle size on the transmission of 24-kc sound over sand bottoms in shallow water. (Report No. M-375.) (n.a.) NObs-2074. UCDWR. December 1, 1945.
- M6** Attenuation and fluctuation studies based on supersonic bottom echoes. (Report No. M-384.) (n.a.) NObs-2074. UCDWR. December 13, 1945.

510.222 Deep Water

- M1** Absorption coefficients of sound in sea water. (Report No. S-1466.) E. B. Stephenson. NRL. August 12, 1938.
- M2** Absorption coefficients of supersonic sound in open sea water. (Report No. S-1549.) E. B. Stephenson. NRL. August 2, 1939.
- M3** Correlation of simultaneous transmission in deep water at different frequencies. (Internal Report No. A-44.) M. J. Sheehy. UCDWR. October 28, 1944.

510.23 Explosion Waves

- M1** The nature of the pressure impulse produced by the detonation of explosives under water. An investigation by the piezoelectric cathode-ray oscillograph method. (Report No. CB-01670-12.) (n.a.) OSRD Liaison Office No. W-201-1e. Admiralty Research Laboratory, Teddington [Great Britain]. November, 1924.
- M2** Propagation of steep-fronted sonic pulses through the sea. (Internal Report No. 66.) (n.a.) OSRD Liaison Office No. W-215-5. HMA/SEE, Fairlie [Laboratory, Great Britain]. March 17, 1942.
- M3** Development of single sweep equipment for impulse work. T. F. Johnston. OSRD No. 766; Section No. C4-sr30-189. UCDWR. April 29, 1942.
- M4** A study of the transmission of explosive impulses in sea water. T. F. Johnston. OEMsr-30. UCDWR. June 25, 1942.
- M5** Explosive sound waves in the sea. Observations

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- M6** Transmission of explosive impulses in the sea. (Report No. U-8.) T. J. Johnston and R. W. Raitt. OEMsr-30; Section No. C4-sr30-403. UCDWR. December 2, 1942.

- M7** The pressure pulses produced by the oscillation of the underwater explosion bubble from 1 oz of polar ammon gelignite. (Note No. ADM/99/ARB.) (n.a.) OSRD Liaison Office No. WA-497-40. Department of Scientific and Industrial Research, Road Research Laboratory [Great Britain]. February, 1943.

- M8** Explosive load on underwater structures as modified by bulk cavitation. (Report No. 511.) E. H. Kennard. US Navy Department, David W. Taylor Model Basin. May, 1943.

- M9** Radial motion of water surrounding a sphere of gas in relation to pressure waves. (Report No. 517.) E. H. Kennard. US Navy Department, David W. Taylor Model Basin. September, 1943.

- M10** Migration of underwater gas globes due to gravity and neighboring surfaces. (Report No. R-182.) E. H. Kennard. US Navy Department, David W. Taylor Model Basin. December, 1943.

- M11** Hydrophone calibration by explosion waves. (Report No. S-2179.) J. L. Carter and M. F. M. Osborne. NRL. April 19, 1944.

- M12** Explosion sounds in shallow water. Maurice Ewing and J. Lamar Worzel. N111s-38137. NOL and WHOI. October 11, 1944.

- M13** The error in the measurement of pressure in an explosion pressure wave due to finite gauge size and to inadequate frequency response of the recording amplifier. (Report No. ADM/219/ARB.) (n.a.) OSRD Liaison Office No. WA-4243-2C. Department of Scientific and Industrial Research, Road Research Laboratory [Great Britain]. February, 1945.

- M14** Deep water sound transmissions from shallow explosions. J. Lamar Worzel and Maurice Ewing. WHOI. (n.d.)

- M15** Note on the second pulse effect for large charges. (Report No. SS-1179.) (n.a.) OSRD Liaison Office No. WA-556-33. [Scientific Section, Mine Design Department, Great Britain.] (n.d.)

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- M1** Observations of echo signals obtained using variable frequency transmission. Edwin M. McMillan. Section No. C4-sr30-208. UCDWR. July 4, 1942.

- M2** The effect of the ship's roll on echo ranging. (Report No. M-114.) John S. McNown and Carl F. Eckart. Section No. 6.1-sr30-1205. UCDWR. October 8, 1943.

- M3** Amplitude fluctuations of transmitted and reflected sound signals in the ocean. (Internal Report No. A-29.) M. J. Sheehy. UCDWR. August 17, 1944.

- M4** Fluctuation of transmitted sound in the ocean. (Technical Memorandum No. 6.) (n.a.) Section No. 6.1-sr1131-1883. CUDWR. January 17, 1945.

510.4 Oceanographic Factors

- M1** Oceanographic factors entering into harbor protection by underwater sonic devices. (n.a.) WHOI. January 21, 1942.

- M2** The prediction of afternoon effect. C. O'D. Iselin and A. H. Woodcock. OEMsr-31; Section No. C4-sr31-137. WHOI. July 25, 1942.

- M3** Reflection of sound in the ocean from temperature changes. (Report No. U-74.) Richard R. Carhart. Service Project No. NS-140; Section No. 6.1-sr30-960. UCDWR. May 17, 1943.

- M4** Statistical importance of oceanographic factors in antisubmarine attacks by surface craft. Lyman Spitzer, Jr. OEMsr-1131; Section No. 6.1-sr1131-1140. CUDWR. December 23, 1943.

- M5** The influence of thermal conditions on transmission of 24-kc sound. (Report No. U-307.) (n.a.) NObs-2074. UCDWR. March 16, 1945.

510.41 Layer Effect

- M1** Range as a function of oceanographic factors. (Bi-weekly report covering period July 25 [to] August 7, 1943.) (n.a.) Service Project No. NO-140; Section No. 6.1-sr31-753. WHOI. August 11, 1943. pp. 1-2.

- M2** Range as a function of oceanographic factors. (Bi-weekly report covering period September 5 [to] 18, 1943.) (n.a.) Service Project No. NO-140; Section No. 6.1-sr31-757. WHOI. September 22, 1943. p. 2.

- M3** Range as a function of oceanographic factors. (Bi-weekly report covering period September 19 [to] October 2, 1943.) (n.a.) Service Project No. NO-140; Section No. 6.1-sr31-758. WHOI. October 6, 1943. pp. 1-2.

- M4** Range as a function of oceanographic factors. (Bi-weekly report covering period October 3 [to] 16, 1943.) (n.a.) Service Project No. NO-140; Section No. 6.1-sr31-759. WHOI. October 20, 1943. p. 3.

- M5** Prediction of sound ranges. (Bi-weekly report covering period October 17 [to] 30, 1943.) (n.a.) Service Project No. NO-140; Section No. 6.1-sr31-1060. WHOI. November 3, 1943. p. 2.

- M6** Prediction of sound ranges. (Bi-weekly report covering period November 14 [to] 27, 1943.) (n.a.) Service Project No. NO-140; Section No. 6.1-sr31-1062. WHOI. December 1, 1943. p. 2.

- M7** Layer effect. (Internal Report No. A-35.) R. W. Raitt and M. J. Sheehy. UCDWR. September 9, 1944.

- M8** Layer effect at 24 kc and 60 kc. (Internal Report No. A-51.) M. J. Sheehy. UCDWR. December 27, 1944.

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- M1** The propagation of underwater sound at low fre-

quencies as a function of the acoustic properties of the bottom. (Report No. S-2113.) John M. Ide, Richard F. Post and William J. Fry. NRL. August 15, 1943.

M2 Some evidence for specular bottom reflections of 24-kc sound. (Internal Report No. A-17.) Richard R. Carhart. UCDWR. June 9, 1944.

M3 Transmission of underwater sound over a sloping bottom. (Internal Report No. A-39.) Richard R. Carhart and K. O. Emery. UCDWR. October 1, 1944.

M4 Acoustic properties of mud bottoms. George P. Woollard. WHOI. December 6, 1944.

520 Reverberation

M1 Reverberation in echo ranging. Part I, General principles. Thomas H. Osgood. OEMsr-20; Section No. C4-sr20-149. CUDWR. July 28, 1942.

M2 Reverberation studies at 24 kc. (Report No. U-7.) (n.a.) OEMsr-30; OSRD No. 1098; Section No. 6.1-sr30-401. UCDWR. November 23, 1942.

M3 Reverberation in echo ranging. Part II, Reverberation found in practice. Thomas H. Osgood. OEMsr-20; Service Project No. NS-140; OSRD No. 1422; Section No. 6.1-sr20-840. CUDWR. April 14, 1943.

520.1 Theory

M1 The theory of reverberation and echo. Carl F. Eckart. OEMsr-30; Section No. C4-sr30-005. UCDWR. July 7, 1941.

M2 Submarine detection. Tentative discussion of reverberations. Harry Nyquist. [Division 6.] October 20, 1941.

M3 Reverberations in sea water. Theoretical considerations. Harry Nyquist. Section No. C4-NDRC-036. [Division 6.] December 19, 1941.

M4 Reverberations in sea water. Temperature gradients near the surface. Harry Nyquist. Section No. C4-NDRC-044. [Division 6.] March 2, 1942.

M5 Microstructure of sea water. Notes on measuring temperature differences. Harry Nyquist. Section No. C4-NDRC-045. [Division 6.] March 12, 1942.

M6 Microstructure in sea water. Theoretical analysis. Harry Nyquist. Section No. C4-NDRC-046. [Division 6.] March 17, 1942.

M7 Theoretical discussion of reverberation. Chaim L. Pekeris. OEMsr-20; OSRD No. 684; Section No. C4-sr20-097. CUDWR. May 29, 1942.

M8 The discrimination of transducers against reverberation. (Report No. U-75.) (n.a.) OSRD No. 1761; Section No. 6.1-sr30-968. UCDWR. May 31, 1943.

M9 Coherence of continuous-wave reverberation. (Memorandum No. SAS-11.) (n.a.) CUDWR. December 20, 1944.

520.11 Scattering

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M2 Multiple scattering. Carl F. Eyring, Ralph J. Christensen and Carl F. Eckart. UCDWR. April 18, 1942.

M3 Fluctuations in reverberation due to scattering centers in water. ([Part, II.] Leonard I. Schiff. University of Pennsylvania. June 5, 1943.

M4 Scattering of sound by the surface of the sea. (Report No. M-217.) Leonard I. Schiff. Service Project No. NS-140. UCDWR. May 15, 1944.

M5 Relation between scattering and absorption of sound. (Memorandum No. SAS-8.) (n.a.) CUDWR. December 11, 1944.

M6 The sea surface and its effect on the reflection of sound and light. (Report No. M-407.) Carl F. Eckart. NObs-2074. UCDWR. March 20, 1946.

520.2 Measurements

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M2 The reverberation equalizer. (Report No. U-97.) George W. Downs, Jr. OEMsr-30; OSRD No. 3100; Section No. 6.1-sr30-692. UCDWR. September 18, 1943.

M3 Apparatus for recording reverberation in the sea. Leonard N. Liebermann. OEMsr-31. WHOI. February 23, 1945.

M4 Summary of the calibration of the reverberation equipment, November 24, 1943 to February 23, 1945. T. H. Schafer. UCDWR. April 18, 1945.

520.21 Shallow Water

M1 Bottom reverberation. Dependence on frequency. (Report No. U-79.) (n.a.) OEMsr-30; Section No. 6.1-sr30-677. UCDWR. June 16, 1943.

M2 Bottom reverberation. (Internal Report No. A-5.) T. H. Schafer. UCDWR. May 16, 1944.

M3 Bottom reverberation at 24-kc E. W. Scripps data. (Internal Report No. A-7.) Richard R. Carhart. UCDWR. May 18, 1944.

M4 Range limitation in shallow water as controlled by bottom character, state of sea and thermal structure. (Internal Report No. A-10.) Francis P. Shepard. UCDWR. May 22, 1944.

M5 Bottom reverberation in very shallow water. (Report No. SM-249.) (n.a.) OEMsr-30; Service Project Nos. NS-140 and NS-297; Section No. 6.1-sr30-1845. UCDWR. August 18, 1944.

520.22 Deep Water

M1 Reverberation and scattering. Series I, Sonar data. (Monthly Progress Report No. MR-345-I [for] July, 1945.) (n.a.) NObs-2074. UCDWR. July, 1945. pp. 4-6.

M2 Limitation of echo ranges by reverberation in deep water. (Report No. M-361.) (n.a.) NObs-2074. UCDWR. September 20, 1945.

- M3** Stratification of sound scatterers in the ocean. (Report No. M-397.) George E. Duvall. NObs-2074. UCDWR. February 16, 1946.
- M4** Forward scattering from the deep scattering layer. (Report No. M-398.) Richard R. Carhart. NObs-2074. UCDWR. March 19, 1946.
- 520.3 Frequency Characteristics**
- M1** Volume reverberation. Scattering and attenuation vs frequency. (Report No. U-50. (n.a.) OEMsr-30; OSRD No. 1555; Section No. 6.1-sr30-670. UCDWR. April 13, 1943.
- M2** Frequency characteristics of echoes and reverberation. (Report No. U-244.) W. M. Rayton and Raymond C. Fisher. OEMsr-30; Service Project No. NS-140; OSRD No. 4159; Section No. 6.1-sr30-1740. UCDWR. August 9, 1944.
- M3** Coherence and fluctuation of frequency modulation reverberation. (Internal Report No. A-37.) M. J. Sheehy. UCDWR. September 19, 1944.
- M4** Frequency characteristics of reverberation. (Memorandum No. SAS-6.) (n.a.) Special Studies Group. November 23, 1944.
- M5** Frequency spread of reverberation as measured with the period meter. (Memorandum No. SAS-6.) (n.a.) Special Studies Group. January 17, 1945.
- 530 Reflection**
- 530.1 Theory**
- M1** Reflection and scattering of sound. (Internal Report No. 50.) (n.a.) OSRD Liaison Office No. WA-92-10f; Section No. C4-brTS-501. HMA/SEE, Fairlie Laboratory, Great Britain. December 21, 1941.
- M2** Diffraction around a cylinder. W. H. Wise. Section No. C4-NDRC-117. [Division 6.] July 15, 1942.
- M3** Reflections from submarines. Martin J. Klein and Joseph B. Keller. OEMsr-1130; Service Project No. NO-222; Section No. 6.1-sr1130-1376. USRL. April 15, 1944.
- M4** Change of average peak echo intensity with changing ping length. (Memorandum No. SAS-30.) Lyman Spitzer, Jr. Special Studies Group. March 22, 1945.
- 530.2 Measurements**
- 530.21 Surface Vessels**
- M1** Oscillograms of 23-kc echoes from a destroyer and its wake. (Report No. M-141.) [Carl F. Eckart.] UCDWR. January 3, 1944.
- M2** Underwater sound reflecting characteristics of surface ships. (Report No. 2320-CS-PD.) C. Shafer, Jr. BTL. October 6, 1944.
- M3** Surface vessel target strengths. (Memorandum No. SAG-38.) (n.a.) Sonar Analysis Group. July 5, 1945.
- 530.22 Submarines**
- M1** General information and sketch book for the engine room personnel of German submarines, Type VII C. (n.a.) Translated by: Fritjof Raven. US Navy Department, David W. Taylor Model Basin. May, 1942.
- M2** Listening techniques. (Bi-weekly report covering period October 4 [to] 17, 1942.) (n.a.) OEMsr-30; Section No. C4-sr30-396. UCDWR. November 7, 1942. p. 5.
- M3** Echoes from a diving submarine and its wake. (Preliminary Report No. M-172.) (n.a.) Service Project No. NS-141. UCDWR. January 22, 1944.
- M4** Data at 45 kc on echoes from a diving submarine and its wake. (Report No. M-172a.) [W. M. Rayton.] OEMsr-30; Service Project No. NS-141; Section No. 6.1-sr30-1475. UCDWR. March 3, 1944.
- M5** Relative echo intensity versus aspect. (Report No. P29/R789.) F. E. Gilbert, Jr. and J. Kneeland Nunan. NLL. March 10, 1944.
- M6** Target strength of a submarine at 24 kc. (Internal Report No. A-4.) George E. Duvall. UCDWR. May 10, 1944.
- M7** Preparation of charts of average echo-ranging conditions. (Bi-weekly Report No. U-248, covering period July 23 [to] August 5, 1944.) (n.a.) OEMsr-30; Service Project No. NO-140; Section No. 6.1-sr30-1745. UCDWR. August 10, 1944. p. 5.
- M8** Preparation of charts of average echo-ranging conditions. (Bi-weekly Report No. U-253, covering period August 6 [to] 19, 1944.) (n.a.) OEMsr-30; Service Project No. NS-140; Section No. 6.1-sr30-1750. UCDWR. August 23, 1944. p. 4.
- M9** An analysis of reflections from submarines. (Technical Memorandum No. 4.) (n.a.) OEMsr-1131; Section No. 6.1-sr1131-1846. CUDWR. September 9, 1944.
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- M2** Chemical recorder traces of submarine wakes at 24 kc. (Internal Report No. A-23.) George E. Duvall. UCDWR. July 18, 1944.
- M3** Sonar submerged submarine wakes. (Serial No. S-RS-96.) [P. H. Hammond.] BuShips Problem No. U2-9CD. NRSL. August 9, 1944.
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- M2** Sound transmission loss through and thickness of the wakes of antisubmarine vessels. (Report No. S-13.) Norman J. Holter. NRSL. November 22, 1943.
- M3** Sound transmission through destroyer wakes. (Report No. M-189.) (n.a.) OEMsr-30; Service Project No. NS-141. UCDWR. March 8, 1944.
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- M2** Thermal wake detection. (Report No. S-20.) David H. Garber, Robert J. Urick and Joseph Cryden. NRSL. January 12, 1945.

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- M1** A survey of ship sounds. Measurements and analyses made from April to August 6, 1941. (n.a.) MIT Research Project DIC-5985. MIT. [August, 1941.]
- M2** Directivity patterns of sound sources. Walter O. Pennell, Malcolm H. Hebb and others. OEMsr-287; Section No. C4-sr287-089. HUSL. April 29, 1942.
- M3** Absolute efficiency of projectors and hydrophones. Eginhard Dietze. OEMsr-20; Section No. C4-sr20-150. USRL. August 3, 1942.

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- M2** Properties of acoustic screens for underwater applications. Leslie L. Foldy. OEMsr-20; Section No. C4-sr20-146. USRL. July 20, 1942.
- M3** Free field reciprocity calibration of Underwater Sound Reference Laboratories' standards. Leslie L. Foldy. OEMsr-20; Section No. C4-sr20-206. USRL. September 11, 1942.
- M4** The measurement of the absolute efficiency of hydrophones. (Report No. G12/R101.) Edward Gerjuoy and Ralph C. Maninger. OEMsr-20; Section No. 6.1-sr20-553. NLL. December 4, 1942.
- M5** The relation between the absolute efficiency of a hydrophone and its thermal noise level. Eginhard Dietze. OEMsr-20; OSRD No. 1086; Section No. C4-sr20-593. USRL. December 11, 1942.
- M6** Measurements of hydrophone sensitivity dependence on static pressure. (Report Series A-1, No. 8.) (n.a.) MIT Research Project DIC-5985. MIT. January 9, 1943.
- M7** Vertical beam pattern measurements by pulse method. Erhard Hartmann. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-605. USRL. February 12, 1943.
- M8** The measurement of the working absolute efficiency of hydrophones. (Report No. G12/R166.) Edward Gerjuoy and Ralph C. Maninger. OEMsr-20; Section No. 6.1-sr20-647. NLL. February 18, 1943.
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- M10** Measurements of AX-48 hydrophones. A discussion of the validity of *Barge* calibrating technique. (Report No. G12/R439.) Edward Gerjuoy. NLL. July 20, 1943.
- M11** Production testing of projectors. Erwin F. Shrader. OEMsr-1130; Service Project No. NS-182; Section No. 6.1-sr1130-1622. USRL. May 22, 1944.
- M12** A calibration system in the lower megacycle range. (n.a.) OEMsr-783; Section No. 6.1-sr783-1697. BTL. August 17, 1944.
- M13** The use of the Henrici harmonic analyser to obtain frequency spectra of pulses. Leslie L. Foldy. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1831. USRL. September 18, 1944.
- M14** Double hydrophone baffle assembly with improved directivity. *Barge* measurements of directivity index. (Report No. G12/R1218.) Wilbur T. Harris and David W. Van Lennep. Service Project No. NS-102. NLL. November 6, 1944.
- M15** Transducer calibration technique. (n.a.) HUSL. December 1, 1944.
- M16** Toll systems; transmission measuring. [The] 31-A transmission measuring set. (Circuit Description; Memorandum No. CD-59120-01.) [Estill I. Green,] BTL. [January 1, 1945.]
- M17** Absorption of coated steel plates. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2146. USRL. April 5, 1945.
- M18** Acoustical calibrations and measurements at the New London Laboratory. (Report No. P34/R1244.) David W. Van Lennep and Ralph C. Maninger. OEMsr-1128; Section No. 6.1-sr1128-2214. NLL. April 30, 1945.
- M19** The acoustic shielding effect of baffles. Joseph B. Keller, Martin J. Klein and Henry Primakoff. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2299. USRL. July 13, 1945.
- M20** Standards used by the Underwater Sound Reference Laboratory. (n.a.) OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2303. USRL. July 23, 1945.
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- M2** Underwater sound standard hydrophones, projectors, and calibration apparatus developed by Bell Telephone Laboratories for the National Defense Research Committee. Robert S. Shankland. [USRL.] August 1, 1942.
- M3** Hydrophone calibrating equipment. Specification. (Report No. G12/R4121.) Roland G. Quest. NLL. September 15, 1942.
- M4** Thermocouple wattmeter. Earl C. Gregg, Jr. USRL. November 23, 1943.
- M5** Response characteristics of interphone equipment. (Division 17. Revision IV.) Leo L. Beranek. OEMsr-658; OSRD No. 3105. Harvard University, Cruft Laboratory. January 1, 1944. p. 15.
- M6** A low-frequency hydrophone calibration system. (n.a.) OEMsr-783; Section No. 6.1-sr783-1308. BTL. January 15, 1944.
- M7** Thermocouple wattmeters using unmatched thermocouples. Earl C. Gregg, Jr. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1360. USRL. January 21, 1944.
- M8** Split projector test unit. Description and operating instructions. (n.a.) OEMsr-287; Section No. 6.1-sr287-1349. HUSL. January 31, 1944.
- M9** Description of the equipment used in the measurement of underwater acoustic transients. Earl C. Gregg, Jr. OEMsr-1130; Service Project No. NS-139; OSRD No. 4515; Section No. 6.1-sr1130-1978. USRL. December 18, 1944.
- M10** Recording wattmeter. Earl C. Gregg, Jr. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2147. USRL. April 18, 1945.
- 553.1 Hydrophone Standards**
- M1** A primary standard pressure gradient hydrophone. (n.a.) OEMsr-212; Section No. C4-sr212-058. BTL. March 2, 1942.

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- M2** A standard crystal hydrophone. (n.a.) OEMsr-212; Section No. C4-sr212-507. BTL. October 1, 1942.
- M3** Calibration measurements on Naval Ordnance Laboratory standards SV No. 1 and No. 2; Radio Corporation of America hydrophone 2A, No. 47; and Brush Development Company hydrophone C21, A2 No. 9. Leslie L. Foldy and Eginhard Dietze. OEMsr-20; OSRD No. 978; Section No. C4-sr20-291. USRL. October 27, 1942.
- M4** Condenser hydrophone for frequencies below 75 cycles per second. (Report Series A-1, No. 12.) Earl C. Gregg, Jr. MIT Research Project DIC-5985. MIT. April 1, 1943.
- M5** Low-frequency calibration measurements on Massachusetts Institute of Technology crystal hydrophones XMS-5, HKC-126 and HKC-127; and MIT condenser hydrophone CMF-3. Leslie L. Foldy. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-881. USRL. June 30, 1943.
- M6** Calibration of Naval Ordnance Laboratory hydrophones, Mark I and Mark II, and Naval Ordnance Laboratory standard hydrophone SV, No. 2. Eginhard Dietze. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-886. USRL. June 30, 1943.
- M7** Wide-range hydrophone for low-sound fields. (n.a.) OEMsr-346; Section No. 6.1-sr346-1321. BTL. March 20, 1944.
- M8** The XMX hydrophone. (n.a.) OEMsr-1046; Service Project No. NS-164 and MIT Research Project DIC-6187; Section No. 6.1-sr1046-2036. MIT. May 31, 1945.

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- M1** Performance characteristics and operating instructions for 1J-type projector. (n.a.) BTL. April 28, 1942.
- M2** Test on model of working standard projector for 25- to 100-kc frequency range. Frank H. Graham and Eginhard Dietze. USRL. May 25, 1942.
- M3** A subaqueous projector for hydrophone calibrations in the audible frequency range. (n.a.) OEMsr-212; OSRD No. 705; Section No. C4-sr212-103. BTL. June 1, 1942.
- M4** Calibration measurements on three intermediate frequency projectors Nos. 2, 4 and 5, covering the frequency range from 7 to 30 kilocycles. Norma Bailey and Frank H. Graham. OEMsr-20; Section No. C4-sr20-152. USRL. August 4, 1942.
- M5** Standard supersonic projectors. (n.a.) OEMsr-212; Section No. 6.1-sr212-625. BTL. January 21, 1943.
- M6** A wide-range projector for the lower audible and upper subsonic frequencies. (n.a.) OEMsr-783; Section No. 6.1-sr783-1213. BTL. November 20, 1943.
- M7** Performance characteristics and operating instructions for National Defense Research Committee 4A projector. (n.a.) BTL. December 6, 1943.

- M8** Calibration of Massachusetts Institute of Technology crystal projector, XPA. L. P. Leighton. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1631. USRL. June 29, 1944.
- M9** Wide-range supersonic projector for calibration work. (n.a.) OEMsr-783; Section No. 6.1-sr783-1325. BTL. August 10, 1944.
- M10** Calibration projector for frequencies from 20 to 150 kilocycles. (n.a.) OEMsr-783; Section No. 6.1-sr783-1329. BTL. February 7, 1945.
- M11** The XPA crystal transducer. (n.a.) OEMsr-1046; Service Project No. NS-164 and MIT Research Project DIC-6187; Section No. 6.1-sr1046-2041. MIT. June 30, 1945.

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- M2** Characteristics of supersonic prism PA1c intended for offshore ship location. W. F. Offutt. OEMsr-20; Section No. C4-sr20-198. USRL. August 18, 1942.
- M3** Characteristics of supersonic prism PA2 intended for offshore ship location. W. F. Offutt. OEMsr-20; Section No. C4-sr20-281. USRL. September 15, 1942.
- M4** Reflections from a two-foot diameter steel sphere. Eginhard Dietze. OEMsr-20; Section No. 6.1-sr20-598. USRL. January 1, 1943.

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- M1** Acoustic tank. (Report No. 2210-ACK-MS.) Arthur C. Keller. BTL. March 8, 1943.
- M2** Measuring tank suitable for acoustic measurements in water. (n.a.) Section No. 6.1-NDRC-836. BTL. March 31, 1943.

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- M1** Automatic frequency response recorder. (Report No. P35/R671.) Alfred K. Tatum. NLL. December 22, 1943.
- M2** Portable polar chart recorder and servomechanisms. (n.a.) OEMsr-287; Section No. 6.1-sr287-2060. HUSL. September 15, 1945.

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- M2** Preliminary calibration of hydrophones. (Report No. 2420-ED-BG.) Eginhard Dietze. BTL. November 8, 1941.
- M3** Preliminary calibration of condenser-type hydrophone, NOCT No. 2. (Report No. 2420-FHG-MA.) Frank H. Graham. BTL. November 21, 1941.
- M4** Hydrophonic work on Case 23211. William H. Martin. BTL. December 4, 1941.
- M5** Preliminary calibration of hydrophones. (Report

- No. 2420-EH-RA.) Erhard Hartmann. BTL. December 20, 1941.
- M6** Calibration of *Semmes* hydrophones. (Report No. G12/1818.) Donald P. Loye. NLL. January 8, 1942.
- M7** Preliminary calibration of two hydrophones designed by Mr. A. L. Thuras: inertia-type hydrophone, TIH, No. 4 and magnetostriction-type, TMSH, No. 1. (Report No. 2420-FHG-AT.) Frank H. Graham. BTL. January 9, 1942.
- M8** Preliminary calibration of two pressure gradient-type hydrophones coded T-22, furnished by the Signal Corps Laboratories, Fort Monmouth, New Jersey. (Report No. 2420-FHG-RK.) Frank H. Graham. BTL. February 6, 1942.
- M9** Calibration of hydrophones and projectors. (n.a.) [CUDWR.] [March 6, 1942.]
- M10** Analysis of calibration data of magnetostriction echo-ranging equipment. (Report No. 2420-WDG-ED-VP.) Walter D. Goodale, Jr. and Eginhard Dietze. BTL. March 18, 1942.
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- M12** Calibration measurements on Naval Ordnance Laboratory's standard velocity-type hydrophone, SV-1. Norma Bailey. OEMsr-20; Section No. C4-sr20-111. USRL. June 18, 1942.
- M13** Directional patterns of sample C-26 sound transceiver built by Brush Development Company. (Report No. D6/R3368.) Ray S. Alleman. NLL. July 10, 1942.
- M14** General Electric Company inertia-type carbon hydrophone, Nos. 1 and 2. Eginhard Dietze. OEMsr-20; Section No. C4-sr20-293. USRL. November 12, 1942.
- M15** Calibration measurements on hydrophones used in the GR-5 and GR-7 offshore units for harbor defense. Frank H. Graham. OEMsr-20; Section No. C4-sr20-294. USRL. November 13, 1942.
- M16** Calibration of Bell Telephone Laboratories' 5A hydrophone. D. Bernard Simmons. OEMsr-20; Section No. C4-sr20-297. USRL. November 16, 1942.
- M17** Listening systems for patrol craft. A multipurpose hydrophone for listening systems. (Progress Report No. 2.) (n.a.) OEMsr-692; Section No. C4-sr692-661. BTL. December 15, 1942.
- M18** Information on low-frequency secondary standard hydrophones, HKC-126 and HKC-127. (Report Series A-1, No. 10.) (n.a.) MIT Research Project DIC-5985. MIT. March 5, 1943.
- M19** Comparison of piezoelectric and magnetostriction hydrophones for sonic listening. (Report No. G27/R130.) James W. Follin, Jr. OEMsr-20; Section No. 6.1-sr20-653. NLL. March 21, 1943.
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- M21** Calibration of Brush crystal hydrophones C43, No. 5 and No. 11; and Thuras magnetostriction hydrophones, Type D-16, Mark IV-D, No. 1 and No. 2. Eginhard Dietze and D. Bernard Simmons. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-871. USRL. May 14, 1943.
- M22** Handbook of DIC-5985 hydrophones. (Report Series A-1, No. 13.) J. E. White and Roland M. Gogolick. MIT Research Project DIC-5985. MIT. May 17, 1943.
- M23** Measurements on CH-10, No. 384 crystal transducer. (Report No. D41/R354.) Edward Gerjuoy. NLL. May 22, 1943.
- M24** Calibration of C21-A2, No. 1 and C21-A2, No. 5 hydrophones from the David Taylor Model Basin. Frank H. Graham. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-877. USRL. June 14, 1943.
- M25** Low-frequency calibration of three Massachusetts Institute of Technology crystal hydrophones, HKB-65, HKB-121 and HKB-125; one MIT magnetostriction hydrophone, HU-9; and the British low-frequency quartz crystal hydrophone, 2V-LF. Leslie L. Foldy. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-879. USRL. June 19, 1943.
- M26** Calibration of five C-50 type hydrophones. Frank H. Graham. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-880. USRL. June 19, 1943.
- M27** Calibration of General Electric Company inertia-type carbon hydrophone units, Nos. 3, 4, 5 and 32. D. Bernard Simmons. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-940. USRL. July 17, 1943.
- M28** A practical dictionary of underwater acoustical devices. (Volume 1 and supplementary loose leaf sheets.) (n.a.) OEMsr-20; OSRD No. 772; Section No. 6.1-sr20-889. USRL. July 27, 1943.
- M29** Calibration of C21-A2, No. 1 and C21-A2, No. 5 hydrophones from the David Taylor Model Basin. Frank H. Graham. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-947. USRL. August 11, 1943.
- M30** Comparison of directive patterns of hydrophones. (Report No. G12/R488.) Albert L. Thuras. NLL. August 28, 1943.
- M31** Measurements of C-26 transducer. (Report No. G13/R662.) Edward Gerjuoy and David W. Van Lennep. NLL. December 29, 1943.
- M32** Measurements of C26-1, No. 4 crystal transducer. (Report No. G13/710.) Edward Gerjuoy. NLL. January 19, 1944.
- M33** Calibration of sound meter and hydrophone. (Report No. P42/R787.) Robert A. Wagner. Service Project No. NS-212. NLL. March 9, 1944.
- M34** Hydrophone preamplifier for Woods Hole Oceanographic Institution. (Report No. P34/R788.) Mark

Harrison. Service Project No. NS-139. NLL. March 9, 1944.

- M35** Recommended calibration of Block Island cable system. (Report No. D12A/R1118.) Henry B. Hoff. Service Project No. NO-163. NLL. September 7, 1944.
- M36** Calibration of NL-130 hydrophones, No. H-191 and No. H-193. L. P. Leighton. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1838. USRL. October 19, 1944.
- M37** Calibration of NL-124 hydrophone, CQA-5107, with NL-129-A baffle Eginhard Dietze and Genevieve D. Weldon. OEMSR-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2135. USRL. February 12, 1945.
- M38** Calibration of NRL-X7 transducer. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2309. USRL. August 29, 1945.

554.1 Projectors

- M1** Analysis of measurements on crystal, JK, echo-ranging projector. (Report No. 2420-WDG-ED-MA.) Walter D. Goodale, Jr. and Eginhard Dietze. BTL. March 27, 1942.
- M2** Effect of painting diaphragm of Radio Corporation of America QC projector, Serial No. 25. Frank H. Graham. OEMsr-20; Section No. C4-sr20-290. USRL. October 26, 1942.
- M3** Calibration measurements on crystal projectors 2B, No. 7 and 3B, No. 8. Eginhard Dietze. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-602. USRL. January 27, 1943.
- M4** Projector patterns of QC-type echo-ranging equipment on board the *USS Sardonyx*. (Report No. P29/A24A/R531.) Robert J. Callen. NLL. September 28, 1943.
- M5** Operating notes for 6B crystal projector. (n.a.) BTL. May 30, 1944.
- M6** The XQHA projector No. 8. Effects of protective sheath and of hydrostatic pressure. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2301. USRL. July 20, 1945.
- M7** Calibration of Submarine Signal Company QGC projector. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2306. USRL. August 13, 1945.

554.2 Magnetostriction Hydrophones

- M1** The tubular magnetostriction microphone. (Report No. G4/1937.) Albert L. Thuras. NLL. March 17, 1942.
- M2** Preliminary calibration of Thuras-type magnetostriction hydrophones for harbor defense. (Report No. 2420-FHG-MS.) Frank H. Graham. BTL. April 29, 1942.
- M3** Development of the directional voice frequency toroidal magnetostriction hydrophone. (Report No. G5S/3413.) Albert L. Thuras. OEMsr-20; OSRD

No. 775; Section No. C4-sr20-214. NLL. July 1, 1942.

- M4** Calibration of toroidal magnetostriction hydrophone with backing plate to reduce rear response. W. F. Offutt. OEMsr-20; Section No. C4-sr20-155. USRL. August 3, 1942.
- M5** Calibration measurements of three special magnetostriction hydrophones from the Bell Telephone Laboratories. Frank H. Graham. OEMsr-20; Section No. C4-sr20-151. USRL. August 4, 1942.
- M6** Calibration measurements of four-foot rubber-covered magnetostriction hydrophone as a hydrophone and as a projector. Frank H. Graham and W. F. Offutt. OEMsr-20; Section No. C4-sr20-196. USRL. August 15, 1942.
- M7** Calibration of two Radio Corporation of America magnetostriction hydrophones in the Mark 9 depth charge container. Frank H. Graham and Norma Bailey. OEMsr-20; Section No. C4-sr20-200. USRL. August 24, 1942.
- M8** Calibration of two 4-foot Thuras magnetostriction hydrophones, No. 9 and No. 10. Norma Bailey and Eginhard Dietze. OEMsr-20; Section No. C4-sr20-203. USRL. September 1, 1942.
- M9** The calibration of toroidal hydrophones in a canvas tank. (Report No. D22.2/3935.) Edward Gerjuoy. OEMsr-20; Section No. C4-sr20-344. NLL. September 23, 1942.
- M10** Calibration tests on toroidal magnetostriction hydrophone system. Norma Bailey and Eginhard Dietze. OEMsr-20; Section No. C4-sr20-284. USRL. September 25, 1942.
- M11** Calibration of three D-16 IV-D magnetostriction hydrophones, Serial Numbers 38, 98 and 105. Frank H. Graham. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-885. USRL. July 7, 1943.
- M12** Calibration data on eight expendable radio sonobuoy hydrophones. (Report No. D16/R472.) Edward Gerjuoy and Ralph R. MacLaughlin. Service Project No. NS-106. NLL. August 11, 1943.
- M13** Measurements on magnetostriction transducer, Model COG-50153. (Report No. C-17.) C. J. Burbank. Service Project No. NS-139. UCDWR. November 8, 1943.
- M14** Measurements of 5-inch straight toroidally-wound hydrophones. Evaluation of annealing of nickel II. (Report No. D16/R610.) Wilbur T. Harris, Ralph R. MacLaughlin and Edward Gerjuoy. Service Project No. NS-106. NLL. November 11, 1943.
- M15** Calibration of A-24, A-25 and A-27 toroidally-wound straight magnetostriction hydrophones. Frank H. Graham and D. Bernard Simmons. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1193. USRL. December 17, 1943.
- M16** Calibration of two B19-B magnetostriction hydrophones, Nos. 61 and 67. Frank H. Graham.

OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1199. USRL. January 17, 1944.

M17 Calibration of magnetostriction hydrophone, Model COG-51053, No. 62. L. P. Leighton, Erwin Shrader and Leslie L. Foldy. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1363. USRL. February 2, 1944.

M18 Non-directional magnetostriction transducer. (n.a.) OEMsr-1097; Section No. 6.1-sr1097-1328. BTL. February 1, 1945.

554.3 Crystal Hydrophones

M1 Preliminary calibration of Brush crystal hydrophones, Model C10-A1. (Report No. 2240-FHG-VY.) Frank H. Graham. BTL. October 18, 1941.

M2 Preliminary calibration of Brush crystal hydrophones, Model C11-A1, Serial No. 6 (NDRC No. 176). (Report No. 2420-ED-EX.) Eginhard Dietze. BTL. December 24, 1941.

M3 Preliminary calibration of crystal hydrophones designed for harbor defense. (Report No. 2420-FHG-TK.) Frank H. Graham. BTL. January 9, 1942.

M4 Preliminary calibration of XEI-2, Serial Nos. 6 and 7, crystal hydrophones. (Report No. 2420-ED-HX.) Eginhard Dietze. BTL. March 17, 1942.

M5 Calibration of crystal hydrophones, HK-18 and HK-35, and of portable acoustic range sound level indicators, PAR-5 and PAR-6. Eginhard Dietze and W. F. Offutt. OEMsr-20; Section No. C4-sr20-113. USRL. June 15, 1942.

M6 Calibration measurements on Brush crystal hydrophones XEI-2, No. 5 and C23-1, No. 2. Frank H. Graham. OEMsr-20; Section No. C4-sr20-114. USRL. June 20, 1942.

M7 Calibration measurements on Submarine Signal Company crystal hydrophones, SS-6-B, SS-6-P, S-124, No. 1 and S-124, No. 2. Frank H. Graham. OEMsr-20; Section No. C4-sr20-144. USRL. July 13, 1942.

M8 Calibration of Massachusetts Institute of Technology crystal hydrophones, HK-29, HP-3 and HP-5, and British crystal hydrophone standard, No. 24. Frank H. Graham and W. F. Offutt. OEMsr-20; Section No. C4-sr20-132. USRL. July 15, 1942.

M9 Calibration of crystal hydrophones C10-A1, No. 11 and C11-A1, No. 13. Eginhard Dietze and Norma Bailey. OEMsr-20; Section No. C4-sr20-148. USRL. July 27, 1942.

M10 Calibration of crystal hydrophones C11-A1, No. 16, C11-A1, No. 17, and HK-15. Norma Bailey and Eginhard Dietze. OEMsr-20; Section No. C4-sr20-147. USRL. July 27, 1942.

M11 The HK microphone preamplifier. (Report Serial No. A-4, Nos. 5 and 7.) A. A. Petrauskas. MIT Research Project DIC-5985. MIT. September 14, 1942.

M12 Calibration measurements on crystal hydrophone, C11-A1, No. 11, with special Naval Ordnance Laboratory preamplifier. Eginhard Dietze. OEMsr-20; Section No. C4-sr20-282. USRL. September 15, 1942.

M13 Calibration measurements of the Brush AX-6 and C-44 dual pattern crystal hydrophones. Frank H. Graham. OEMsr-20; Section No. C4-sr20-285. USRL. September 30, 1942.

M14 Calibration measurements on Brush crystal hydrophones, C-23 No. 355, C-37 No. 1, AX-10 No. 4 and AX-10 No. 5. Leslie L. Foldy. OEMsr-20; Section No. C4-sr20-286. USRL. October 5, 1942.

M15 Calibration of two C-23 hydrophones, Serial Nos. 703 and 707, and one HK-21 hydrophone, MIT [Research Project] DIC-5985. Frank H. Graham. OEMsr-20; Section No. C4-sr20-298. USRL. November 20, 1942.

M16 Calibration measurements on Brush AX-6-F dual pattern crystal hydrophones. Norma Bailey and Eginhard Dietze. OEMsr-20; Section No. C4-sr20-299. USRL. November 26, 1942.

M17 Calibration measurements on crystal hydrophone C11-2, No. 11, with redesigned special Naval Ordnance Laboratory preamplifier. Norma Bailey. OEMsr-20; Section No. C4-sr20-596. USRL. December 18, 1942.

M18 Calibration measurements on the Massachusetts Institute of Technology crystal hydrophones, HK-35, XMS-3Y, XMS-5, XMS-6, HKA-57, HKC-59 and XMQ-1. D. Bernard Simmons. OEMsr-20; Section No. 6.1-sr20-599. USRL. January 6, 1943.

M19 Electrical impedance of Massachusetts Institute of Technology Rochelle salt hydrophones. (Report Series A-1, No. 9.) (n.a.) MIT Research Project DIC-5985. MIT. January 25, 1943.

M20 Calibration of Brush dual pattern AX-47 and AX-47-1 crystal hydrophones. Norma Bailey. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-610. USRL. March 9, 1943.

M21 Preliminary calibration of three Massachusetts Institution of Technology crystal hydrophones, HKB-65, HKB-121 and HKB-125; one MIT magnetostriction hydrophone, HU-9; and the British low-frequency quartz crystal hydrophone. Norma Bailey. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-619. USRL. May 6, 1943.

M22 Measurements of AX-58 hydrophones. (Report No. G27/R353.) Edward Gerjuoy. NLL. May 21, 1943.

M23 Calibration of the Naval Research Laboratory tourmaline hydrophones, OL-A-3 and OL-A-4. D. Bernard Simmons. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-884. USRL. June 28, 1943.

M24 Measurements of AX-50 hydrophones. (Report No. G12/R408.) Edward Gerjuoy. NLL. June 30, 1943.

M25 Calibration of Brush crystal hydrophone AX-58,

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- No. 6. Frank H. Graham. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-949. USRL. August 17, 1943.
- M26** Calibration of HT-1 tourmaline crystal hydrophone and C11-A1, No. 22 Rochelle salt crystal hydrophone. D. Bernard Simmons. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-952. USRL. August 30, 1943.
- M27** Measurements of AX-58, No. 6 Brush crystal hydrophone. (Report No. G12/554.) Edward Gerjuoy. NLL. October 19, 1943.
- M28** Calibration of AX-50, No. 2 and AX-50, No. 3 crystal hydrophones. D. Bernard Simmons. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1181. USRL. October 22, 1943.
- M29** Calibration of several Brush C-11 hydrophone units used with Naval Ordnance Laboratory Mark 3 acoustic system. L. P. Leighton. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-1182. USRL. October 27, 1943.
- M30** Measurements of 3A, No. 35 crystal hydrophone. (Report No. G12/R579.) Edward Gerjuoy. NLL. October 30, 1943.
- M31** Measurements of AX-50, No. 2 and AX-50, No. 3 hydrophone. (Report No. G12/R583.) Edward Gerjuoy. NLL. November 1, 1943.
- M32** Calibration of Brush AX-68, No. 4 and C45-C, No. 1 crystal hydrophones. D. Bernard Simmons. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-1184. USRL. November 11, 1943.
- M33** Calibration of Brush AX-57, No. 2 ADB crystal hydrophone, and AX-74, No. 1; C49-1, No. 175; C37-5, No. 72, Rochelle salt crystal hydrophones. D. Bernard Simmons. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1185. USRL. November 12, 1943.
- M34** Measurements on crystal transducer, CS2-3, No. 1122. (Report No. C-24.) C. J. Burbank. Service Project No. NS-139. UCDWR. November 19, 1943.
- M35** Measurements of C-35 Brush crystal hydrophones, [the] Navy JO gear. (Report No. G12/R619.) Edward Gerjuoy. NLL. November 20, 1943.
- M36** Calibration of HKC-59, HKB-78, XMX-1, and B19-B, No. 25 hydrophones. L. P. Leighton. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1362. USRL. February 1, 1944.
- M37** Calibration of AX-105, No. 1 and No. 2 transducers with EN-1 noise generator. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1371. USRL. March 24, 1944.
- M38** Calibration of 5D-1 crystal hydrophone. D. Bernard Simmons. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1375. USRL. April 13, 1944.
- M39** Calibration of GBL-2 crystal hydrophone. (Report No. G12/R914.) David W. Van Lennep. Service Project No. NS-139. NLL. May 10, 1944.
- M40** Calibration of Brush AX-68, No. 4 and C45-C, No. 1 crystal hydrophones. (Addendum to Report No. 6.1-sr20-1184.) Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1624. USRL. May 26, 1944.
- M41** Calibration tests on four XMX hydrophones. L. P. Leighton. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1635. USRL. July 11, 1944.
- M42** Calibration of CY4-35 crystal hydrophone, Serial No. 1235. L. P. Leighton. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1637. USRL. July 17, 1944.
- M43** Calibration of tourmaline hydrophone No. 529 manufactured by the Stanolind Oil and Gas Company. Frank H. Graham. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1828. USRL. September 8, 1944.
- M44** Calibration of Stanolind Oil and Gas Company tourmaline gauges. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1971. USRL. October 31, 1944.
- M45** Calibration of RQ-51055, AX-58-A, hydrophones to be employed with OAY sound meters. Comparison of two methods. (Report No. D53/R1271.) David W. Van Lennep. Service Project No. NS-212. NLL. December 7, 1944.
- M46** Calibration of C-37 hydrophone. Eginhard Dietze and L. P. Leighton. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2130. USRL. January 31, 1945.
- M47** Calibration of three AX-120 hydrophones. (Report No. G12/R1419.) William B. Snow. Service Project No. NS-102. NLL. February 28, 1945.
- M48** The AX-48-A ammonium dihydrogen phosphate crystal hydrophone. (Report No. G12/R1417.) William B. Snow. Service Project No. NS-102. NLL. February 28, 1945.
- 554.4 Special Devices**
- M1** Tests on 100-kc proximity fuze. Eginhard Dietze. OEMsr-20; Section No. C4-sr20-106. USRL. June 5, 1942.
- M2** Calibration of Bell Telephone Laboratories' 10-kilocycle transceiver units, Nos. 1 and 2. Eginhard Dietze. OEMsr-20; Section No. C4-sr20-592. USRL. December 10, 1942.
- M3** Calibration of dual pattern AX-3C hydrophones and of C-17 hydrophone mounted on test pot, Mark 15. Eginhard Dietze. OEMsr-20; Section No. C4-sr20-594. USRL. December 15, 1942.
- M4** Calibration of Bell Telephone Laboratories' 20-kc and 40-kc transceiver units, No. 1 and No. 2. Eginhard Dietze. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-613. USRL. March 29, 1943.
- M5** Calibration of standard practice target transducers, BDI-32, No. 337 and CDI-21, No. 283. Frank H. Graham. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-614. USRL. March 30, 1943.
- M6** Calibration of San Diego crystal transceiver GA2-2,

No. 355. Eginhard Dietze. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-873. USRL. May 18, 1943.

- M7** Calibration of C49-1 hydrophones in Mark 13-5 mine case. L. P. Leighton. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1372. USRL. March 30, 1944.
- M8** Calibration of Radio Corporation of America Laboratories' USDAR 1000 units, No. 1 and No. 2. Earl C. Gregg, Jr. and Eginhard Dietze. OEMsr-1130; Service Project No. NS-297; Section No. 6.1-sr1130-1632. USRL. June 30, 1944.
- M9** Calibration of Radio Corporation of America Laboratories' USDAR 500 units, No. 1. L. P. Leighton. OEMsr-1130; Service Project No. NS-297; Section No. 6.1-sr1130-1821. USRL. August 15, 1944.
- M10** Calibration of Radio Corporation of America Laboratories' USDAR 250 units, Serial No. 1. L. P. Leighton and Joseph B. Keller. OEMsr-1130; Service Project No. NS-297; Section No. 6.1-sr1130-1822. USRL. August 18, 1944.
- M11** Calibration of Naval Research Laboratory small object locator. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1979. USRL. December 19, 1944.
- M12** Calibration of projector for underwater object locator equipment, UOL. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2302. USRL. July 23, 1945.
- M13** Calibration of XQHA scanning sonar. Leslie L. Foldy. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2370. USRL. September 10, 1945.
- M14** Experimental 3½-layer XQHA transducer. Genevieve D. Weldon and Frank H. Graham. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2372. USRL. September 18, 1945.

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Domes

- M1** Memorandum regarding recent tests on domes under Naval Research Laboratory supervision. Gaylord P. Harnwell. Division 6. August 12, 1941.
- M2** QC projector water-noise measurements [on the] *USS Rathburne*. Frederick A. Everest and David J. Evans. [UCDWR.] February 24, 1942.
- M3** Calibration of steel domes for echo-ranging projectors. Eginhard Dietze. OEMsr-20; Section No. C4-sr20-153. USRL. August 7, 1942.
- M4** Directivity measurements on British-type steel dome for echo-ranging projectors. Eginhard Dietze and Norma Bailey. OEMsr-20; Section No. C4-sr20-289. USRL. October 26, 1942.
- M5** Echo-ranging performance of Budd 1/16-inch corrugated domes filled with prestone and water. Ralph B. Bowersox, Cassius M. Clay, Jr. and others. OEMsr-287; Section No. 6.1-sr287-769. HUSL. April 30, 1943.
- M6** Advantages of aluminum as a dome material.

Theoretical study. Leslie L. Foldy. OEMsr-20; Service Project No. NS-142; Section No. 6.1-sr20-882. USRL. June 23, 1943.

- M7** Calibration tests on two 54-inch British-type domes with expanded metal stainless steel windows. Eginhard Dietze. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-887. USRL. July 6, 1943.
- M8** Calibration tests on a Radio Corporation of America 14-inch permanent magnet echo-ranging projector, Model No. 3, in a WEA-2 dome. Eginhard Dietze. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-944. USRL. July 23, 1943.
- M9** Calibration tests on a 57-inch Budd dome with expanded metal stainless steel window. Genevieve D. Weldon and Eginhard Dietze. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-948. USRL. August 16, 1943.
- M10** Calibration measurements on a Radio Corporation of America 9-inch projector with 1/16-inch corprene band in a .020-inch experimental WEA-1 dome. Eginhard Dietze. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-951. USRL. August 24, 1943.
- M11** Calibration tests on a 100-inch expanded metal stainless steel dome section, QGA. L. P. Leighton and Eginhard Dietze. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-953. USRL. September 2, 1943.
- M12** Calibration measurements on a modified WEA-1 dome, [the] New London B dome. L. P. Leighton and Frank H. Graham. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-954. USRL. September 2, 1943.
- M13** Calibration of Model C dome for WEA-1 echo-ranging system. L. P. Leighton. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-959. USRL. October 15, 1943.
- M14** Calibration measurements on an aluminum dome and two steel domes for use with WEA-1 equipment. L. P. Leighton. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1192. USRL. December 15, 1943.
- M15** Calibration tests on the Naval Research Laboratory corrugated dome. L. P. Leighton. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1194. USRL. December 28, 1943.
- M16** The acoustic properties of domes. (Part I.) Henry Primakoff. OEMsr-1130; Service Project No. NS-182; Section No. 6.1-sr1130-1197. USRL. January 5, 1944.
- M17** The acoustic properties of domes. (Part II.) Henry Primakoff. OEMsr-1130; Service Project No. NS-182; Section No. 6.1-sr1130-1366. USRL. February 18, 1944.
- M18** The effect of Naval Research Laboratory anti-fouling paint No. 364 on the acoustic properties of a 54-inch dome. Eginhard Dietze and L. P.

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Leighton. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1368. USRL. March 6, 1944.

- M19** Calibration of 54-inch expanded metal stainless steel Budd dome with reinforcements. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1373. USRL. April 5, 1944.
- M20** Calibration of the QCU, No. 3 and QCU, No. 5 projectors in the QCU dome. Frank H. Graham. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1379. USRL. April 28, 1944.
- M21** Comparison of two 54-inch domes, one equipped with 20-mil window and the other with 30-mil window. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1628. USRL. June 19, 1944.
- M22** Effect of Naval Research Laboratory antifouling paint No. 364 used on domes. (Report No. C-57.) (n.a.) Service Project No. NS-139. UCDWR. June 22, 1944.
- M23** Monitoring CMB-78165A projectors inside 54-inch domes. (Report No. C-58.) (n.a.) Service Project No. NS-139. UCDWR. June 23, 1944.
- M24** The effect of Naval Research Laboratory anti-fouling paint No. 364 on the acoustic properties of echo-ranging domes. Eginhard Dietze and Frank H. Graham. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1633. USRL. July 1, 1944.
- M25** Comparison of acoustic properties of QCU baffles manufactured by the Edward G. Budd Manufacturing Company. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1823. USRL. August 21, 1944.
- M26** Calibration of 54-inch dome with experimental Naval Research Laboratory rubber window. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1982. USRL. January 3, 1945.
- M27** Calibration of Radio Corporation of America 14-inch ammonium dihydrogen phosphate crystal projector and QCU-2 dome. Eginhard Dietze and Genevieve D. Weldon. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2140. USRL. February 26, 1945.
- M28** Vertical directivity tests on Naval Research Laboratory corrugated dome. Eginhard Dietze and Genevieve D. Weldon. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2143. USRL. February 28, 1945.

556 Sonar Systems

- M1** Calibration of University of California, Division of War Research, frequency modulated sonar. Leslie L. Foldy. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2139. USRL. February 24, 1945.

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- M2** Calibration measurements on crystal supersonic listening unit, JK-9. Frank H. Graham and Eginhard Dietze. OEMsr-20; Section No. C4-sr20-115. USRL. June 20, 1942.
- M3** Calibration of Submarine Signal Company echo-ranging projector. Eginhard Dietze. OEMsr-20; Section No. C4-sr20-202. USRL. September 3, 1942.
- M4** Calibration measurements on parabolic hydrophone assembly, Navy Type CBD-51035. T. Blewitt. OEMsr-20; Section No. C4-sr20-280. USRL. September 23, 1942.
- M5** Calibration of Submarine Signal Company combination WEA-2 projector and dome. Eginhard Dietze and Norma Bailey. OEMsr-20; Section No. C4-sr20-295. USRL. November 16, 1942.
- M6** Note on back and side radiation of the WEA-1, Radio Corporation of America 9-inch, projector. Robert L. Cumberow and Francis P. Bundy. OEMsr-287; Section No. C4-sr287-380. HUSL. November 21, 1942.
- M7** Measurement of the angular characteristics of the WEA-1 projector. (Report No. G13/R175.) Edward Gerjuoy. NLL. February 23, 1943.
- M8** Radio Corporation of America echo-ranging equipment WEA-1, Serial No. 159, and RCA engineering standard WEA-1 projector. Eginhard Dietze. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-607. USRL. February 25, 1943.
- M9** Angular characteristics of the WEA-1 used as a hydrophone. (Report No. G13/R176.) Edward Gerjuoy. NLL. March 2, 1943.
- M10** Calibration of US Navy sound power units, Serial Number 3554-L-D. Frank H. Graham. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-611. USRL. March 10, 1943.
- M11** Calibration measurements on several WEA-1 Radio Corporation of America echo-ranging projectors. Eginhard Dietze. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-875. USRL. June 4, 1943.
- M12** Overall calibration of NL-105, No. 9 amplifier, and COG-51053, No. 30 hydrophone and baffle. (Report No. G12/G7/R447.) Roland G. Quest. NLL. July 21, 1943.
- M13** Calibration of QBG crystal transducer, No. 603. L. P. Leighton and Eginhard Dietze. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-941. USRL. July 21, 1943.
- M14** Calibration of JP Nos. 1, 2, 3 and 4, and COG-51053 tubular magnetostriction hydrophones. D. Bernard Simmons. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-942. USRL. July 22, 1943.

- M15** Calibration of two experimental model magnetostriction projectors, QGB-A and QGB-B, for use in bearing deviation indicator modified echo ranging. Frank H. Graham. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-943. USRL. July 23, 1943.
- M16** Calibration of an experimental model magnetostriction 26-kc projector, QGB, Model C. Frank H. Graham. OEMsr-20; Section No. 6.1-sr20-957. USRL. September 28, 1943.
- M17** Calibration of a 14-inch ammonium dihydrogen phosphate crystal projector, AX-63 No. 1, manufactured by the Brush Development Company. Leslie L. Foldy and Frank H. Graham. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1187. USRL. November 16, 1943.
- M18** Calibration of hydrophones used with the Model JQ and modified JQ sound receiving equipments. Frank H. Graham. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1190. USRL. December 14, 1943.
- M19** Calibration of Submarine Signal Company experimental ammonium dihydrogen phosphate crystal projector SK-5982 in QB housing. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1191. USRL. December 15, 1943.
- M20** Measurements on QB transducer CBM-78115, No. 41. (Report No. C-32.) C. J. Burbank. OEMsr-30; Service Project No. NS-139; Section No. 6.1-sr30-1312. UCDWR. December 17, 1943.
- M21** Calibration of QC projector CBM-78183, No. 565. Frank H. Graham and Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1196. USRL. January 4, 1944.
- M22** Calibration of a QB-733J transducer. (Report No. G27/R718.) David W. Van Lennep. Service Project No. NS-139. NLL. April 28, 1944.
- M23** Calibration of four QB-733R transducers. (Report No. G27/R878.) David W. Van Lennep. Service Project No. NS-139. NLL. May 1, 1944.
- M24** Calibration of 94111-A, 94120 and 94211-A transducers and the 100-inch dome used in the QGA echo-ranging system. Frank H. Graham. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1626. USRL. June 7, 1944.
- M25** Calibration of QBF projector No. 461 in dome No. 14. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1634. USRL. July 5, 1944.
- M26** Measurements on QB Submarine Signal Company projector. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1820. USRL. August 11, 1944.
- M27** Calibration of Harvard Underwater Sound Laboratory HP-4, No. 1 laminated stack transducer, sword arm depth angle transducer, and B19-H hydrophone. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1826. USRL. August 28, 1944.
- M28** Calibration of Submarine Signal Company projector 947, No. 65, US Navy CBM-78214, for fathometer use. Frank H. Graham. OEMsr-1130; Service Project No. NS-297; Section No. 6.1-sr1130-1837. USRL. October 13, 1944.
- M29** Calibration of QJB projector No. 637. Eginhard Dietze and Genevieve D. Weldon. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1986. USRL. January 16, 1945.
- M30** Calibration of ammonium dihydrogen phosphate, QGB and NMC sonar-ranging projectors manufactured by the Radio Corporation of America. Frank H. Graham. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1985. USRL. January 16, 1945.
- M31** Calibration of two ammonium dihydrogen phosphate crystal projectors. Eginhard Dietze and Genevieve D. Weldon. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1988. USRL. January 25, 1945.
- M32** Calibration of the Naval Research Laboratory tourmaline hydrophones, OL-A-1 and OL-A-2. Cathleen Anderson. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2132. USRL. January 31, 1945.
- M33** Calibration of Bell Telephone Laboratories, Inc. ammonium dihydrogen phosphate crystal projector. Eginhard Dietze and L. P. Leighton. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2131. USRL. February 1, 1945.
- M34** Calibration of experimental QCU projector, Models No. 1 and No. 2. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2138. USRL. February 24, 1945.
- M35** Captured Japanese acoustic equipment. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2291. USRL. May 24, 1945.
- M36** Experimental football-type WFA-1 topside projector. Frank H. Graham. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2295. USRL. June 25, 1945.
- M37** US Navy sonar equipment. (n.a.) OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2307. USRL. August 24, 1945.

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- M1** Calibration of British echo-ranging unit, Asdic A/S-96. E. Carstensen. OEMsr-20; Service Project No. NS-139; Section No. 6.1-sr20-608. USRL. March 4, 1943.
- M2** Calibration of British quartz crystal hydrophone, No. 34. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1364. USRL. February 4, 1944.
- M3** Measurements on Type 135 Asdic magnetostriction transducer. (Report No. 53.) (n.a.) Service Project No. NS-139. UCDWR. May 18, 1944.

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- M4** Calibration of British quartz crystal hydrophone No. 34. (Addendum to Report No. 6.1-sr1130-1364.) Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1623. USRL. May 24, 1944.
- M5** Calibration of Asdic set, Type 135. Erwin F. Shrader. OEMsr-1130; Service Project No. NS-297; Section No. 6.1-sr1130-1827. USRL. September 4, 1944.
- M6** Calibration of 147B British Asdic sword arm depth angle transducer. Eginhard Dietze and L. P. Leighton. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2134. USRL. February 6, 1945.
- M7** Calibration of Asdic transducer, Type 150. Erwin F. Shrader. OEMsr-1130; Service Project No. NS-297; Section No. 6.1-sr1130-2136. USRL. February 17, 1945.
- 560 Recognition**
- 560.1 Physiological Factors**
- M1** Telegraph theory. Electrical equivalent of the ear as a receiver. Harry Nyquist. [Division 6.] January 13, 1942.
- M2** Binaural phenomena. (Report No. P12/4089.) Ralph C. Maninger. NLL. September 29, 1942.
- M3** Interval tests. (Report No. D13/R249.) Harold L. Bumbaugh. NLL. April 8, 1943.
- M4** Tone duration as a factor in pitch discrimination. (Report No. M-179.) E. G. Wever. UCDWR. February 16, 1944.
- M5** A study of binaural perception of the direction of a sound source. Irving Langmuir, Vincent J. Schaefer and others. OEMsr-323; OSRD No. 4079; Section No. 6.1-sr323-1840. GE. June 30, 1944.
- 560.2 Listening**
- M1** Submarine detection. Directivity indications. Harry Nyquist. [Division 6.] October 11, 1941.
- M2** Subaqueous listening. Directivity of a pair of rings. Harry Nyquist. Section No. C4-NDRC-064. [Division 6.] April 2, 1942.
- M3** Frequency sensitivity curves for Type W-621 headphones. (Internal Report No. 89.) (n.a.) OSRD Liaison Office No. W-282-15. HMA/SEE, Fairlie [Laboratory, Great Britain]. May 21, 1942.
- M4** Directivity with two microphones. Harry Nyquist. Section No. C4-NDRC-071. [Division 6.] June 12, 1942.
- M5** Directivity with two microphones. Addition vs multiplication of outputs. Harry Nyquist. Section No. C4-NDRC-073. [Division 6.] July 1, 1942.
- M6** Masking of submarine noise by a sound composed of a finite number of single frequency tones. (Memorandum No. SAG-32.) Edward Gerjuoy. Sonar Analysis Group. April 28, 1945.
- M7** An experimental study of masking by a line spectrum. (Report No. M-314.) (n.a.) NObs-2074. UCDWR. June 7, 1945.
- 560.21 Laboratory Tests**
- M1** An investigation of the audibility of underwater noises. (Report No. 1.) W. F. Higgins. OSRD Liaison Office No. WA-317-18. National Physical Laboratory [Great Britain]. July 17, 1942.
- M2** An investigation of the audibility of underwater noises. (Second Report.) W. F. Higgins. OSRD Liaison Office No. WA-317-19. National Physical Laboratory [Great Britain]. August 24, 1942.
- M3** An investigation of the audibility of underwater noises. (Third Report.) C. G. Darwin. OSRD Liaison Office No. WA-2125-6B. National Physical Laboratory [Great Britain]. April 28, 1944.
- M4** Masking experiments. ([Part] I. Report No. U-229.) (n.a.) OEMsr-30; Service Project Nos. NO-163 and NS-164; Section No. 6.1-sr30-1751. UCDWR. June 28, 1944.
- M5** Peak recognition tests. (Report No. P33/R1053.) Donald L. Cole and Sylvester J. Haefner. NLL. August 14, 1944.
- M6** Masking experiments. ([Part] II. Report No. U-258.) (n.a.) OEMsr-30; Service Project Nos. NO-163 and NS-164; Section No. 6.1-sr30-1757. UCDWR. September 15, 1944.
- M7** Frequency weighting in ship sound measurements. An audibility meter. (Report No. M-399.) R. S. Gales, L. S. Goldberg and A. M. Small. NObs-2074. UCDWR. March 19, 1946.
- 560.22 Field Tests**
- M1** Binaural tests on the *Amada*, September 15, 1942. (Report No. P12/4021.) Donald P. Loye. NLL. September 18, 1942.
- M2** Binaural tests on the *Amada*, September 24, 1942. (Report No. P12/4090.) Donald A. Proudfoot. NLL. October 1, 1942.
- 560.3 Echo Ranging**
- M1** Submarine detection. Scheme employing frequency modulation in transmitted signal. Harry Nyquist. Section No. C4-NDRC-039. [Division 6.] January 5, 1942.
- M2** Selectivity in Asdic reception. (Internal Report No. 109.) (n.a.) OSRD Liaison Office No. WA-362-9. HMA/SEE, Fairlie [Laboratory, Great Britain]. November 9, 1942.
- M3** Submarine detection. Pinging patterns. Harry Nyquist. Section No. 6.1-NDRC-126. [Division 6.] March 28, 1944.
- M4** Comparison of loudspeaker and telephones for detectability of weak echoes. (Internal Report No. 178.) H. M. McNair and R. Hall. OSRD Liaison Office No. WA-2246-5A. HMA/SEE, Fairlie [Laboratory, Great Britain]. May 8, 1944.
- M5** The detectability of repeated pulses. (Report No. M-261.) Raymond C. Fisher and Carl F. Eckart.

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560.31 Noise Masking

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- M2 Telegraph signaling. Aural reception vs other. Report of laboratory tests. (Report No. 3410-RSA-MS.) R. S. Alford. BTL. July 2, 1942.

560.32 Reverberation Masking

- M1 The detection of an echo in the presence of reverberation. Carl F. Eckart. OEMsr-30; OSRD No. 173; Section No. C4-sr30-175. UCDWR. May 12, 1942.
- M2 Automatic gain control in echo-ranging systems. (Report No. D-4330.) J. Anderson. OSRD Liaison Office No. WA-854-15a. HMA/SEE, Fairlie [Laboratory, Great Britain]. July 14, 1943.
- M3 The D-Series of doppler drills and tests. A report on the psychological standards of auditory discrimination. (Report No. U-206.) Adelbert Ford. OEMsr-30; OSRD No. 3691; Section No. 6.1-sr30-1505. UCDWR. March, 1944.
- M4 Single tone carrier telegraphy. Comparison of masking effect of thermal noise vs reverberations. (Report No. 210-KWP-QY.) Kenneth W. Pfleger. Section No. 6.1-NDRC-1482. [Division 6.] August 28, 1944.
- M5 Comparison of loudspeaker and telephones for recognition of doppler. (Internal Report No. 199.) H. M. McNair. OSRD Liaison Office No. WA-3065-8. HMA/SEE, Fairlie [Laboratory, Great Britain]. October 17, 1944.
- M6 Laboratory tests of the masking of echoes by reverberation. R. S. Alford and W. E. Reid. OEMsr-346; Section No. 6.1-sr346-2126. BTL. June 8, 1945.

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- M1 Submarine detection. Aural vs automatic reception. Harry Nyquist. [Division 6.] December 1, 1941.
- M2 Telegraph theory. Aural reception vs other. Harry Nyquist. [Division 6.] December 11, 1941.

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- M1 A summary of factors governing sound ranges. (Preliminary edition.) George P. Woollard. WHOI. June, 1944.
- M2 Computed maximum echo and detection ranges for submarine echo-ranging gear. William B. Snow and Edward Gerjuoy. Section No. 6.1-sr1131, 1128-1688. CUDWR. July, 1944.

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- M1 Predicted maximum listening ranges in sonic and

supersonic listening to submarines and surface ships. J. W. Emling and M. T. Dow. BTL. August 30, 1943.

- M2 Current methods for prediction of maximum sound ranges. (Technical Memorandum No. 1.) (n.a.) CUDWR. May 1, 1944.
- M3 Bathythermograph predictions, Key West area. Gordon A. Riley. US Navy Department, Oceanography Office. June 7, 1944.
- M4 A review of the problem of predicting ranges in shallow water. (n.a.) WHOI. August 17, 1944.
- M5 Maximum echo ranges in shallow water. (Technical Memorandum No. 5.) (n.a.) CUDWR. October 21, 1944.
- M6 Prediction of sonic and supersonic listening ranges. (n.a.) Service Project No. NS-140; Section No. 6.1-sr1131-1884. CUDWR. December, 1944.
- M7 Memorandum summarizing discussions with Lieutenant Rather concerning possible methods of overcoming very bad sound conditions. (n.a.) WHOI. December 12, 1945.

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570.21 Echo Ranges

- M1 Sound-ranging experiments at Key West, July, 1941. Maurice Ewing. OSRD No. 725; Section No. C4-sr31-130. WHOI. May 23, 1942.
- M2 Echo-range observations of the *USS Sylph*. Maurice Ewing. OEMsr-31; Section No. C4-sr31-142. WHOI. September 10, 1942.
- M3 Asdic area trials. (Internal Report No. 127.) G. E. R. Deacon and H. Wood. HMA/SEE, Fairlie [Laboratory, Great Britain]. May 10, 1943.
- M4 Sonar tests of tilting beam sound gear on [the] *USCG335*. (n.a.) US Navy Department, Oceanography Office. March 4, 1944.
- M5 Sonar echo-ranging tests [on the] *YMS370*. (n.a.) US Navy Department, Oceanography Office. March 18, 1944.
- M6 Sonar sub runs by [the] *USCGC Blanco*. [William Wood.] US Navy Department, Oceanography Office. May 15, 1944.
- M7 Echo-ranging tests [on the] *DD745*. (n.a.) US Navy Department, Oceanography Office. [July, 1944.]
- M8 Echo-range data [for the period] June 2 to June 15, 1944. [Gordon A. Riley.] US Navy Department, Oceanography Office. [July 3, 1944.]
- M9 Echo-ranging data [in the] Miami area. [L. V. Worthington and Helen S. Magee.] US Navy Department, Oceanography Office. July 5, 1944.
- M10 A comparison of achieved and predicted echo ranges on submerged submarines in deep water. (n.a.) WHOI. August 19, 1944.
- M11 Achieved echo ranges on surface ship targets in deep and shallow water. (n.a.) WHOI. August 30, 1944.
- M12 Echo-range data, Key West operating area [for

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- M13** Tests made with the QDA/OKA stabilized depth determining gear on the *USS Semmes*, to ascertain the accuracy of depth indications with adverse temperature conditions. Thomas S. Austin. WHOI. January 11, 1946.

570.22 Listening Ranges

- M1** Maximum listening ranges of underwater sound equipment. (Report No. P33/R794.) Ralph C. Maninger. NLL. March 13, 1944.
- M2** Addendum I to: Maximum listening ranges of underwater sound equipment. (Report No. P33/R794.) (Report No. P33/R1008.) LeRoy A. Woodward. NLL. July 1, 1944.

580 Noise

- M1** Survey of underwater sound. (Report No. 1.) Vern O. Knudsen, R. S. Alford and J. W. Emling. Section No. 6.1-NDRC-729. Division 6. February 26, 1943.
- M2** Spectrograms of underwater sounds. Final report on Project NO-221. W. Koenig, Jr. and J. W. Emling. OEMsr-346; Service Project No. NO-221; Section No. 6.1-sr346-1682. BTL. June 10, 1944.

580.1 Submarines

- M1** Submarine noise and performance of JP-1 sonic listening equipment aboard the *USS Corvina* (SS226) (from) September 13 (to) 14, 1943. (Report No. D24/R526.) Hollie C. Williams. NLL. September 17, 1943.
- M2** Survey of underwater sound. Sounds from submarines. (Report No. 2.) Vern O. Knudsen, R. S. Alford and J. W. Emling. Section No. 6.1-NDRC-1306. Division 6. December 31, 1943.
- M3** Key West trials, January 10 (to) 16, 1944. (Report No. D16/R778.) Walter L. Clearwaters and Price E. Fish. Service Project No. NS-106. NLL. March 2, 1944.
- M4** Submarine listening range at Loch Goil. Rodney F. Simons. OSRD Liaison Office No. WA-1730-8D. (Great Britain.) March 8, 1944.
- M5** *USS Shark*. Noise vs speed tests. (Report No. P32/P33/R812.) William B. Snow and Henry B. Hoff. NLL. April 12, 1944.
- M6** Sound output measurements on *USS Bluegill* at 62-, 150- and 250-foot keel depths. (n.a.) OEMsr-1046; Service Project No. NS-164 and MIT Research Project DIC-6187; Section No. 6.1-sr1046-1050. MIT. May 15, 1944.
- M7** Analyses of reduction gear noise in water (on the) *USS Blackfin* (SS322). (Report No. D53/R1042.) Edwin E. Teal and Robert W. Pratt. NLL. July 24, 1944.
- M8** Submarine sounds recorded for Mare Island Navy

Yard. (Report No. M-277.) (n.a.) UCDWR. November 18, 1944.

- M9** Sound cavitation tests on *USS Springer* (SS414). (Report No. M-283.) (n.a.) UCDWR. December 20, 1944.
- M10** Underwater sound output of *USS Spot* (SS413). (Report No. M-296.) (n.a.) NObs-2074. UCDWR. March 1, 1945.
- M11** Underwater sound output of *USS Tinosa* (SS283). (Report No. M-303.) (n.a.) UCDWR. March 5, 1945.

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- M1** The acoustic fields of ships of various kinds as determined on the Mark 2 acoustic range at Wolf Trap. (Report No. 700.) (n.a.) NOL. March 25, 1943.
- M2** Oscillograms of 24-kc noise produced by a destroyer. (Internal Report No. A-2.) George E. Duvall. UCDWR. May 1, 1944.
- M3** Underwater sound measurements on aircraft carriers. (Report No. M-212.) (n.a.) Service Project No. NO-163. UCDWR. May 15, 1944.
- M4** Underwater sound output of cruiser, destroyer and aircraft carrier. (Report No. SM-268.) (n.a.) UCDWR. October 28, 1944.
- M5** Acoustic measurements (75-150 cps) on escort vessels at Treasure Island, California. (Report No. AAR-35.) Joseph Ashbrook. US Navy Department, Bureau of Ordnance. December 1, 1944.
- M6** Acoustic measurements (75-150 cps) on merchant vessels at Treasure Island, California. (Report No. AAR-36.) A. B. McCaleb. US Navy Department, Bureau of Ordnance. December 29, 1944.
- M7** Survey of underwater sound. Sounds from surface ships. (Report No. 4.) M. T. Dow, J. W. Emling and Vern O. Knudsen. OSRD No. 5424; Section No. 6.1-NDRC-2124. Division 6. June 15, 1945.

580.3 Background Noise

580.31 Aircraft Noise

- M1** Effects of airplane noise on listening with headphones. Experiments conducted at the Psycho-Acoustic Laboratory, Harvard University, September 27 to 29, 1942 and November 6 to 8, 1942. (Report No. D16/D34/R107.) William B. Snow and William D. Neff. OEMsr-20; Section No. 6.1-sr20-550. CUDWR. January 25, 1943.
- M2** Airplane detection by submarines. (Report No. P33/R897.) Edward Gerjuoy. NLL. May 10, 1944.
- M3** Sonar hut noise measurements on a frigate. (Report No. M-324.) (n.a.) NObs-2074. UCDWR. June 11, 1945.

580.32 Self-Noise

- M1** Self-noise in sonar gear. (Report No. C-2(01.332).)

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580.33 Ambient Noise

M1 Sound survey. San Francisco harbor during November, 1942. (Report No. U-27.) (n.a.) UCDWR. February 3, 1943.

M2 Survey of underwater sound. Ambient noise. (Report No. 3.) Vern O. Knudsen, R. S. Alford and J. W. Emling. Section No. 6.1-NDRC-1848. Division 6. September 26, 1944.

M3 Ambient noise survey. Miami area and the East Coast of the United States. (Report No. D46A/R1215.) Henry B. Hoff, Donald L. Cole and Robert A. Wagner. OEMsr-1128; Service Project No. NO-163; Section No. 6.1-sr1128-1944. NLL. May 5, 1945.

600 SONAR RESEARCH AND DEVELOPMENT

M1 Sonar scanning systems. Roy C. Hopgood. OSRD No. 3220; Section No. 6.1-NDRC-1307. Division 6. January, 1944.

610 Transducers

611 Crystal Transducers

M1 Condensed description of Brush hydrophones and underwater transducers. (Report No. LR-118.) Frank Massa. Brush Development Company. September 9, 1943.

M2 Field and pattern of 3 x 12 X-cut crystal transducer made by Massachusetts Institute of Technology. Paul E. Sabine. [HUSL.] January 20, 1944.

611.1 Piezoelectric Crystals, Properties of

M1 Interelectrode leakage of Rochelle salt crystals used in piezoelectric devices. ([Technical Memorandum No.] MM-41-160-52.) H. J. McSkimin. BTL. October 14, 1941.

M2 Fundamental studies on X-cut Rochelle salt Darol K. Froman. OEMsr-30; Section No. C4-sr30-392. UCDWR. July 15, 1942.

M3 Properties of 45° Y-cut Rochelle salt crystals and the load-carrying capacity of liquids used with them. (n.a.) OEMsr-346; OSRD No. 1308; Section No. 6.1-sr346-627. BTL. December 15, 1942.

M4 The electrical resistivity of crystals of ammonium and potassium dihydrogen phosphate. ([Technical Memorandum No.] MM-43-160-32.) J. B. Johnson and H. B. Briggs. BTL. March 20, 1943.

M5 Constants and temperature coefficients of ammonium dihydrogen phosphate crystals. ([Technical Memorandum No.] MM-43-160-38.) W. P. Mason and R. G. Kinsley. BTL. March 30, 1943.

M6 Data on piezoelectric PN crystals. (Report No. LR-112.) Hans Jaffe. Brush Development Company. Revised: November 23, 1943.

M7 Electrical measurements for 45° Z-cut ammonium

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M8 Ammonium dihydrogen phosphate crystals. [Part] I, Growing ADP crystals and establishment of pilot plant. [Part] II, Processing ADP crystals. [Part] III, Electrical testing of ADP crystals. (n.a.) NXss-31643 and NXsr-46932; Task Nos. 7 and 8. BTL and BuShips. December 15, 1945.

611.2 Design Data

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M2 Mechanical and acoustic attachments for piezoelectric crystals used in transducers. (n.a.) OEMsr-346; Section No. 6.1-sr346-628. BTL. December 15, 1942.

M3 Dissipation of energy in crystal transducers. Glen D. Camp. [UCDWR.] February 19, 1944.

M4 Specification for ammonium dihydrogen phosphate crystal plates. (Addendum A attached. Report No. RE-13A-922A.) (n.a.) BuShips. March 16, 1944.

M5 The investigation of adhesives for ammonium dihydrogen phosphate crystal assemblies, Bell Telephone Laboratories. ([Technical Memorandum No.] MM-44-120-99.) (n.a.) BTL. October 10, 1944.

M6 The design of crystal vibrating systems for projectors and other applications. William J. Fry, John M. Taylor and Bertha W. Henvis. NRL. August, 1945.

612 Magnetostriction Transducers

612.1 Magnetostriction Principles

M1 Hydrophonic listening devices. (Report No. 2420-ED-WDG-KM.) Eginhard Dietze and Walter D. Goodale, Jr. BTL. December 3, 1941.

M2 Magnetostrictive transducers. Malcolm H. Hebb and Harvey A. Brooks. OEMsr-287; Section No. 6.1-sr287-898. HUSL. June 22, 1943.

M3 General ideas on permanent magnet polarization of magnetostrictive transducers. Francis P. Bundy. [HUSL.] September 29, 1943.

M4 Permanent magnet polarization of magnetostrictive sonar transducer. Francis P. Bundy. [HUSL.] October 4, 1943.

M5 Permanent magnet polarization of laminated magnetostrictive transducer elements by use of bi-metallic sheets. Specific application to No. 2 sonar elements. Francis P. Bundy. [HUSL.] October 14, 1943.

M6 Permanent magnet polarization of laminated ring stacks. Francis P. Bundy. [HUSL.] October 25, 1943.

M7 Electrodynamic transducers for supersonic underwater sound. Malcolm H. Hebb. HUSL. September 13, 1944.

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- M8** Transducer research and production at the New London Laboratory. (Report No. G12/R1418.) William B. Snow, James W. Follin, Jr. and Wilbur T. Harris. OEMsr-1128; Service Project No. NS-113; Section No. 6.1-sr1128-2212. NLL. May 25, 1945.

612.2 Acoustic Theory

612.21 Directivity

- M1** Directivity of radiation [covering the period] from October, 1941 [to] March, 1942. O. Hugo Schuck and others. [HUSL.] March, 1942.
- M2** On the theory of the directionality patterns of continuous source distributions on a plane surface. (Report No. MM-42-110-5.) R. Clark Jones. BTL. March 10, 1942.
- M3** Directivity of sound in water. Elementary arrays. Harry Nyquist. Section No. 6.1-NDRC-072. Division 6. June 24, 1942.
- M4** Program for studies of delay method of making toroidal hydrophone uni-directive. (Report No. G12/3769.) J. Warren Horton. NLL. August 21, 1942.
- M5** Sign convention in pattern measurements. Frederick V. Hunt. [HUSL.] July 14, 1943.
- M6** Theoretical directivity characteristics for line hydrophones. (Report No. G12/R450.) Wilbur T. Harris. NLL. August 26, 1943.
- M7** Pattern requirements for sonar transducer. Malcolm H. Hebb. [HUSL.] October 15, 1943.
- M8** Shifted lobe and simultaneous lobe comparison patterns of a phase and shaded square transducer. Gerald I. Harrison. [HUSL.] November 19, 1943.
- M9** Advantages of increased hydrophone length to sonic listening. (Report No. G12/R631.) Albert L. Thuras. Service Project No. NS-113. NLL. December 6, 1943.
- M10** Theoretical patterns for circular radiators. Nelson M. Blachman. [HUSL.] December 30, 1943.
- M11** Directivity ratios for circular pistons. Nelson M. Blachman. [HUSL.] February 3, 1944.
- M12** Delay network to obtain front-to-back discrimination. (Report No. G12/R743.) James W. Follin, Jr. Service Project No. NS-139. NLL. February 11, 1944.
- M13** The vertical pattern of a split sonar element. Malcolm H. Hebb and Nelson M. Blachman. [HUSL.] March 1, 1944.
- M14** Circular transducer patterns. Gerald I. Harrison. [HUSL.] April 7, 1944.
- M15** Patterns of radiators in pressure-release baffles. Gerald I. Harrison. [HUSL.] April 12, 1944.
- M16** Single element pattern of cylindrical transducer. Gerald I. Harrison. [HUSL.] April 28, 1944.
- M17** Elimination of side-lobe interference in the right-left indicator. Part I, Theoretic. (Report No. G12/R947.) James W. Follin, Jr. NLL. June 8, 1944.
- M18** Directivity ratio of transducers. Gerald I. Harrison. [HUSL.] August 21, 1944.
- M19** Shaded line sources. Gerald I. Harrison. [HUSL.] September 7, 1944.
- M20** Directivity ratios. Malcolm H. Hebb. [HUSL.] November 2, 1944.
- M21** Directivity at low sonic frequencies. (Report No. P33/R1067.) Walter F. Graham and Ralph C. Maninger. NLL. November 8, 1944.
- M22** Pattern of a sector of a cylinder. Gerald I. Harrison. [HUSL.] November 14, 1944.
- M23** Improvement in submarine sonic listening and bearing accuracy. (Report No. G12/R1251.) Albert L. Thuras. Service Project No. NS-102. NLL. November 21, 1944.
- M24** Directivity patterns of a delobed hydrophone for various octave bands. (Report No. G12/R1254.) Jordan J. Markham. Service Project No. NS-102. NLL. November 27, 1944.
- M25** A statistical theory of errors in pattern formation. Gerald I. Harrison. [HUSL.] December 28, 1944.
- M26** Pattern of a 270° sector. Gerald I. Harrison. [HUSL.] January 5, 1945.
- M27** Theoretical formulae of hydrophone patterns integrated over a band of frequencies. (Report No. G12/R1301.) LeRoy A. Woodward. Service Project No. NS-102. NLL. January 8, 1945.
- M28** Pattern of a 270° sector. (Corrected.) Gerald I. Harrison. [HUSL.] January 26, 1945.
- M29** Scattering and radiation from circular cylinders and spheres. Tables of amplitudes and phase angles. (AMP Report No. 62.1 R.) Arnold N. Lowan, Philip M. Morse and others. OEMsr-1046; MIT Research Project DIC-6187; Section No. 6.1-sr1046-2032. MIT and AMP. February, 1945.
- M30** Pattern of 270° and 90° sectors. (Really correct.) Gerald I. Harrison. [HUSL.] February 26, 1945.
- M31** Scanning sonar, Directional transmitting beam for Frederick V. Hunt. HUSL. March 17, 1945.
- M32** Total attenuation patterns. Gerald I. Harrison. [HUSL.] March 24, 1945.
- M33** Transmission pattern for constant echo strength. Gerald I. Harrison. [HUSL.] March 26, 1945.
- M34** Advance notice of report on directivity patterns. (n.a.) OEMsr-58. HUSL. (n.d.)

612.22 Efficiency and Threshold

- M1** Relation between power delivered by a hydrophone and its absolute efficiency. (Report No. 2420-ED-LA.) Eginhard Dietze. [BTL.] August 29, 1941.
- M2** Computation of absolute efficiency of a hydrophone from its sensitivity. (Report No. 2420-ED-F.) Eginhard Dietze. [BTL.] August 29, 1941.
- M3** Absolute efficiency of hydrophones. (Report No. 2420-ED-EN.) Eginhard Dietze. [BTL.] October 18, 1941.
- M4** Noise level in small magnetostriction hydrophones. (Report No. D16/2814.) William B. Snow. NLL. May 15, 1942.
- M5** Efficiency of magnetostriction transducers. Malcolm H. Hebb. [HUSL.] August 14, 1942.

- M6** Relation between sensitivity and efficiency of a hydrophone. Harvey A. Brooks. [HUSL.] December 4, 1942.
- M7** Shock excitation of resonant transducers. Harvey A. Brooks. [HUSL.] December 17, 1942.
- M8** Efficiency and sensitivity of cone-type magnetostriction transducers. Harvey A. Brooks. [HUSL.] January 4, 1943.
- M9** Efficiency of magnetostrictive transducers. Harvey A. Brooks. [HUSL.] January 19, 1943.
- M10** Figure of merit for magnetostrictive transducers. Harvey A. Brooks and Malcolm H. Hebb. [HUSL.] June 29, 1943.
- M11** A simplified method of computing potential efficiencies. Harvey A. Brooks. [HUSL.] September 30, 1943.
- M12** Further generalization of the concept of potential efficiency applicable to any resonant transducer. Harvey A. Brooks. [HUSL.] October 1, 1943.
- M13** Non-linear magnetostrictive equations. Magnetostrictive transducer at high power. Malcolm H. Hebb. [HUSL.] March 23, 1944.
- 612.23 Frequency Response**
- M1** Harmonic operation of standard projectors. Frederick V. Hunt. [HUSL.] June 23, 1943.
- M2** Open circuit frequency response of parallel-tuned transducer. Malcolm H. Hebb. [HUSL.] November 16, 1943.
- 612.3 Transducer Networks**
- M1** Magnetostrictive transducers. Representation of solid horn by four-terminal network. Malcolm H. Hebb. [HUSL.] November 3, 1943.
- M2** Motional admittance. Malcolm H. Hebb. [HUSL.] November 20, 1943.
- M3** Networks with 90° difference in phase over two octaves. Claude W. Horton. [HUSL.] December 11, 1944.
- 612.31 Equivalent Circuits**
- M1** Equivalent circuits for electromechanical transducers. Edwin M. McMillan. [UCDWR.] January 10, 1942.
- M2** Equivalent circuit of magnetostriction oscillators. Harvey A. Brooks. [HUSL.] June 5, 1942.
- M3** Series and parallel tuning of transducers. Malcolm H. Hebb. [HUSL.] October 13, 1942.
- M4** Elementary results regarding tuning of magnetostriction microphones. Harvey A. Brooks. [HUSL.] December 1, 1942.
- M5** Equivalent circuit for magnetostrictive transducers. Malcolm H. Hebb. [HUSL.] July 12, 1943.
- M6** Relation between electromechanical coupling and $DQ/|Z_c|$. Malcolm H. Hebb. [HUSL.] February 16, 1944.
- M7** Elimination of eddy currents in magnetostriction hydrophones. (Report No. G12/R742.) James W. Follin, Jr. Service Project No. NS-139. NLL. February 24, 1944.
- M8** Coupling tests on segmented and unsegmented ladderphone stacks, LDPI No. 1 and No. 2. William T. Bartholomew and Francis P. Bundy. [HUSL.] March 16, 1944.
- M9** Equivalent circuit for magnetostrictive transducers. Robert E. Payne. [HUSL.] August 3, 1944.
- M10** Equalization of hydrophones. Nelson M. Blachman. [HUSL.] October 31, 1944.
- 612.32 Impedance**
- M1** The geometrical inversion transformation and its application in the admittance-impedance relations. Analytical admittance-impedance relations. Robert E. Payne and Malcolm H. Hebb. [HUSL.] January 26, 1944.
- M2** Radiation impedance and equivalent circuits. Malcolm H. Hebb, Gerald I. Harrison and Nelson M. Blachman. [HUSL.] June 17, 1944.
- M3** Impedance diagram for parallel-tuned magnetostrictive transducer. Malcolm H. Hebb. [HUSL.] June 28, 1944.
- 612.33 Coupling**
- M1** Optimum coupling between microphone and amplifiers. (Report No. G12/2805.) William B. Snow. NLL. May 15, 1942.
- 612.34 Band-Pass Circuits**
- M1** Band-pass characteristics of magnetostrictive transducers. Malcolm H. Hebb and Nelson M. Blachman. [HUSL.] January 28, 1944.
- M2** Methods of obtaining band-pass characteristics with magnetostriction transducers. James W. Follin, Jr. [HUSL.] February 17, 1944.
- M3** Band-pass transducers. Frederick V. Hunt. [HUSL.] February 19, 1944.
- M4** Some qualitative notes on band-pass transducers. Benjamin B. Drisko. [HUSL.] March 8, 1944.
- M5** Band-pass transducers. Malcolm H. Hebb and Nelson M. Blachman. [HUSL.] March 23, 1944.
- M6** Lamination design to minimize the Q. Nelson M. Blachman. [HUSL.] June 17, 1944.
- M7** Q and the Bell Telephone Laboratory. Malcolm H. Hebb. [HUSL.] March 12, 1945.
- 612.4 Materials**
- M1** Magnetic materials for magnetostriction microphones. (Report No. MM-42-110-14.) H. J. Williams and R. M. Bozorth. [BTL.] July 7, 1942.
- M2** Measurements of the permeability of magnetostrictive materials. Howard C. Hardy. [HUSL.] January 14, 1943.
- M3** Visit to Bell Telephone Laboratories, November 18 and 19 [1943]. Francis P. Bundy. [HUSL.] November 27, 1943.
- M4** Visit to Bell Telephone Laboratories, November 18 and 19 [1943]. James W. Follin, Jr. [HUSL.] December 3, 1943.
- M5** A comparison of some possible materials for use

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in JP-1 baffles. (Report No. G12/R805.) Wilbur T. Harris, David W. Van Lennep and Robert R. MacLaughlin. Service Project No. NS-113. NLL. March 15, 1944.

- M6** Magnetic materials for magnetostriction microphones and projectors. (Report No. MM-44-110-14.) H. J. Williams, E. A. Nesbitt and M. Goertz. [BTL.] March 22, 1944.

612.41 Nickel

- M1** Residual magnetism in an unannealed nickel B-Type hydrophone. Paul E. Sabine. [HUSL.] January 28, 1943.
- M2** Acoustic properties of hydrogen-annealed nickel. Nelson K. Moody, Jr. and Harvey A. Brooks. [HUSL.] July 5, 1943.
- M3** Visit to laboratory of E. M. Wise of the International Nickel Company, Inc., on July 13, 1943. Malcolm H. Hebb and Francis P. Bundy. [HUSL.] July 27, 1943.
- M4** Nickel alloys for transducers. Frederick V. Hunt. [HUSL.] July 30, 1943.
- M5** Tests on hydrophones with shells specially heat treated by C. G. Conn, Ltd. (Report No. D16/R473.) Robert R. MacLaughlin. Service Project Nos. AC-55 and NS-102. NLL. August 11, 1943.
- M6** Nickel strip material. Alan H. Selker. [HUSL.] August 24, 1943.
- M7** Heat treatment of nickel. (Report No. G12/R530.) Robert R. MacLaughlin. NLL. September 14, 1943.
- M8** Measurements of 5-inch toroidally-wound magnetostriction hydrophones. Evaluation of annealing of nickel. (Report No. D16/R555.) Edward Gerjuoy and Wilbur T. Harris. NLL. October 19, 1943.
- M9** Magnetic properties and electrical resistivities of oxide-annealed and cold-worked nickel [Grade] A. Shiao T. Pan. [HUSL.] November 8, 1943.
- M10** Performance of the 5-inch 20-kc oxide-annealed ring stacks, 20 ARS-2. Francis P. Bundy. [HUSL.] November 8, 1943.
- M11** Performance of the 5-inch 20-kc hardened nickel ring stack, 20 HRS-1. Jack C. Cotton and Francis P. Bundy. [HUSL.] November 17, 1943.
- M12** Hard nickel laminated transducers as powerful underwater sound projectors. Francis P. Bundy and Roland E. Mueser. [HUSL.] December 3, 1943.
- M13** Magnetic properties of [Grade] A nickel for use in laminated transducers. James W. Follin, Jr. and Shiao T. Pan. OEMsr-287; Section No. 6.1-sr287-1352. HUSL. January 25, 1944.
- M14** Construction and performance of echo-repeater pair, 1-inch hard nickel and 2-inch annealed nickel ring stacks. Jack C. Cotton and Francis P. Bundy. [HUSL.] February 17, 1944.
- M15** Retest of 6 B-19B hydrophones from Harvey Radio after reannealing the shell. Paul E. Sabine. [HUSL.] February 24, 1944.

M16 Annealing of JP-1, straight wood core, hydrophone. (Report No. G12/R753.) Hector F. Bernier. Service Project Nos. NS-139 and NS-113. NLL. February 26, 1944.

M17 Grade A nickel annealed in hydrogen. Shiao T. Pan. [HUSL.] April 13, 1944.

M18 Handling equipment for cleaning, annealing and coating nickel laminations. Paul E. Sabine. [HUSL.] April 20, 1944.

M19 Effect of annealing on the magnetic properties of nickel tubing. (Report No. G12/R928.) Albert L. Thuras and James W. Follin, Jr. NLL. May 16, 1944.

M20 Half-hard Grade A nickel. Shiao T. Pan. [HUSL.] July 6, 1944.

M21 Variation of magnetization in legs of PM polarized SPEP element with driving field. Shiao T. Pan. [HUSL.] December 6, 1944.

M22 Reversible permeability and hysteresis loss in oxide-annealed [Grade] A nickel polarized at $B_0 = 4100$. Shiao T. Pan. [HUSL.] December 12, 1944.

612.42 Alloys

- M1** Properties and uses of Alnico magnets. Kenneth N. Fromm and Francis P. Bundy. [HUSL.] April 23, 1943.
- M2** Visit to West Lynn Laboratory of General Electric regarding materials for permanent magnets. Francis P. Bundy. [HUSL.] September 25, 1943.
- M3** General magnetic properties and magnetostrictive properties of hydrogen-annealed 0.005-inch 45 permalloy sheets. Shiao T. Pan. HUSL. January 15, 1944.
- M4** [The] 8-Va vicalloy. Shiao T. Pan. [HUSL.] February 15, 1944.
- M5** [The] 2-V permendur. Shiao T. Pan. HUSL. March 14, 1944.
- M6** Bieber's alloy. Shiao T. Pan. [HUSL.] April 26, 1944.
- M7** Magnetic properties of 45 permalloy. Shiao T. Pan and B. A. Wooten. OEMsr-287; Section No. 6.1-sr287-1542. HUSL. April 30, 1944.
- M8** Compressed metallic dust as a magnetostrictive material. William T. Bartholomew and Francis P. Bundy. [HUSL.] July 7, 1944.
- M9** The 6.5-V vicalloy. Shiao T. Pan. [HUSL.] July 12, 1944.
- M10** Weston permalloy powder cores. Shiao T. Pan. [HUSL.] July 19, 1944.
- M11** A detailed study of sintered-oxide magnets in HP-3 stacks. Shiao T. Pan, Milton R. Carlson and Francis P. Bundy. [HUSL.] November 22, 1944.
- M12** The magnetostriction, Young's modulus and damping of 68 permalloy as dependent on magnetization and heat treatment. (Magnetics; Monograph B-1303.) H. J. Williams, R. M. Bozorth and H. Christensen. BTL. (n.d.)

612.43 Rubber

- M1 The ρ c rubber. Francis P. Bundy. [HUSL.] June 10, 1943.
- M2 Transducer cable shield with conducting rubber. Herbert R. Stewart. [HUSL.] July 13, 1943.
- M3 Rubber for underwater use. Alan H. Selker. [HUSL.] March 31, 1944.
- M4 Suggested tests of acoustical transparency and damping of rubber and rubber substitutes. Francis P. Bundy. [HUSL.] May 2, 1944.
- M5 Transmission and reflection characteristics of rubber discs, natural and GR-S artificial. Jack C. Cotton. [HUSL.] May 11, 1944.
- M6 Transducers separated from the water by rubber or oil. Nelson M. Blachman. [HUSL.] May 12, 1944.
- M7 Rubber-covered SPEP element. Gerard W. Renner. [HUSL.] May 15, 1944.
- M8 Transmission loss in natural and synthetic rubbers. Paul E. Sabine. [HUSL.] May 24, 1944.
- M9 Transmission and reflection characteristics of rubber discs, natural and artificial. (Part II.) Jack C. Cotton. [HUSL.] June 3, 1944.
- M10 Transmission and density tests on twenty-one natural rubber discs. Jack C. Cotton. [HUSL.] June 9, 1944.
- M11 More transmission tests: Tyler No. 212, rubberized canvas, neoprene [and] ρ c rubber. Jack C. Cotton. [HUSL.] June 14, 1944.
- M12 Transmission tests [of] fifteen Tyler Rubber, No. 212, SPEP faces, July 8, 1944. Jack C. Cotton. [HUSL.] July 10, 1944.
- M13 Sound transmission loss of SPEP face made by Alfred Hale Rubber Company. Paul E. Sabine. [HUSL.] October 4, 1944.
- M14 Measurement on SPEP stacks cemented to various diaphragms: rubber, stainless steel [and] plastic. Jack C. Cotton. [HUSL.] November 24, 1944.
- M15 Rubber faces for Leeds and Northrup SPEP transducers. Francis P. Bundy. [HUSL.] February 23, 1945.
- M16 Sound attenuation in coating materials. Alan H. Selker and Gerard W. Renner. [HUSL.] April 9, 1945.
- M17 Some applications of organic plastics and rubber in underwater sound apparatus. Alan H. Selker. [HUSL.] May 26, 1945.

612.44 Plastics and Paints

- M1 Liquid within dome. Addition of aerosol. Hayward W. Henderson. [HUSL.] April 22, 1943.
- M2 Cycleweld. Francis P. Bundy. [HUSL.] September 18, 1943.
- M3 Tests on some new DuPont adhesives. Gerard W. Renner. [HUSL.] October 4, 1943.
- M4 Notes on painting JP-1 hydrophones. (Report No. D24/R539.) Frank M. Goyan. NLL. October 6, 1943.
- M5 Blister rubber paint. Francis P. Bundy. [HUSL.] November 9, 1943.

- M6 Performance characteristics of a plastic-covered toroidally-wound hydrophone and baffle assembly. (Report No. G12/R708.) Wilbur T. Harris. Service Project No. NS-139. NLL. January 19, 1944.
- M7 Plastic molding materials for transducers as developed at New London Laboratory. Francis P. Bundy. [HUSL.] March 6, 1944.
- M8 Visit to New London, April 19 [1944]. Plastic potting. Alan H. Selker. [HUSL.] April 20, 1944.
- M9 Tests on two plastic-covered, three-foot straight toroidally-wound hydrophones. (Report No. G12/R915.) David W. Van Lennep. Service Project No. NS-139. NLL. May 12, 1944.
- M10 Miracle adhesives. Francis P. Bundy and Leon W. Camp. [HUSL.] May 18, 1944.
- M11 Consolidation of nickel laminations. Leon W. Camp. [HUSL.] July 26, 1944.
- M12 High-pressure water test on plastic cast transducer. Gerard W. Renner and Alan H. Selker. [HUSL.] October 2, 1944.
- M13 Oil filling of transducers. Alan H. Selker. [HUSL.] April 10, 1945.
- M14 Organic cements in underwater sound apparatus. Alan H. Selker. [HUSL.] April 18, 1945.

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Measurements

- M1 Graphical evaluation of the effect on right-left indicator accuracy of an interfering signal and a study of the relative merits of the two-section, 5-foot hydrophone vs the ten-section, PM, 5-foot lobe reduction hydrophone from an interference view point; frontal lobe section only. (Report No. D55/R1144.) Frederick C. Reed, Jr. Service Project No. NS-113. NLL. September 22, 1944.

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Theory and Techniques

- M1 Frequency response curves. Malcolm H. Hebb. [HUSL.] January 7, 1943.
- M2 Capacity of ground in calibration of transducers. Harvey A. Brooks and Malcolm H. Hebb. [HUSL.] February 1, 1943.
- M3 Direction of rotation of transducers in the measurement of directivity patterns. Robert L. Cumerow. [HUSL.] July 3, 1943.
- M4 Directivity index data sheets. Jack C. Cotton. [HUSL.] December 10, 1943.
- M5 Determination of E, λ and electromechanical coupling coefficient from impedance data. Shiao T. Pan. [HUSL.] December 22, 1943.
- M6 Simplified conversion procedure for field and frequency-response data. Jack C. Cotton. [HUSL.] February 18, 1944.
- M7 Effect of cable on the measure voltage terminal of a transducer. Louis Fein. [HUSL.] February 22, 1944.
- M8 Effect of shell painting upon the acoustic functioning of the M7/CRT-1A hydrophone. (Report No. D16/R799.) Robert R. MacLaughlin and

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David W. Van Lennep. Service Project No. NS-106. NLL. March 20, 1944.

M9 Measurement of reflection coefficient. Malcolm H. Hebb and Nelson M. Blachman. [HUSL.] May 19, 1944.

M10 Field variations at the *Barge*. Louis Fein and Aaron B. Powers. [HUSL.] August 7, 1944.

M11 Hydrophone tests adopted at the New London Laboratory of Columbia University, Division of War Research. (Report No. G12/R1092.) William B. Snow. OEMsr-1121; Section No. 6.1-sr1121-1849. NLL. September 1, 1944.

M12 Tests adopted by the Hydrophone Standards Committee, July 10, 1944. (Report No. G12/R1342.) William B. Snow, James W. Follin, Jr. and others. Service Project Nos. NS-102 and NS-139. NLL. January 27, 1945.

M13 Field variations at the Sweetwater Lake Calibration Station of the University of California, Division of War Research. Paul Ebaugh. [HUSL.] February 20, 1945.

M14 The nature of field intensity variations at Spy Pond. Roland E. Mueser. [HUSL.] February 21, 1945.

M15 How not to explain field variations. Louis Fein, Paul Ebaugh and Roland E. Mueser. [HUSL.] May 28, 1945.

M16 Bubble trouble, continued. Roland E. Mueser. [HUSL.] May 29, 1945.

M17 A calibrated field for hydrophone testing. ([Memorandum] C.) Roland E. Mueser. [HUSL.] June 6, 1945.

M18 The accuracy of an acoustic measurement. ([Memorandum] A.) Roland E. Mueser. [HUSL.] June 6, 1945.

612.511 Impedance

M1 Underwater impedance measurements. Richard L. Brown and John R. Pellam. OEMsr-287; Section No. C4-sr287-093. HUSL. May 8, 1942.

M2 Underwater impedance measurements. (Condensed report.) Richard L. Brown and John R. Pellam. OEMsr-287; Section No. C4-sr287-094. HUSL. May 8, 1942.

M3 Comments on: Underwater impedance measurements, by Richard L. Brown and John R. Pellam, NDRC Report No. 264.1. H. T. O'Neil. [UCDWR.] August 12, 1942.

M4 Direct measurement of complex impedance. (n.a.) [HUSL.] March 31, 1943.

M5 Fourth floor impedance measurements. Paul M. Kendig. [HUSL.] August 23, 1943.

M6 Some geometrical relations in the impedance diagram. James W. Follin, Jr. HUSL. October 11, 1943.

M7 Measurements of high-impedance transducers at the *Barge*, even if one side is grounded. Louis Fein. [HUSL.] November 15, 1944.

612.512 Reciprocity

M1 The alleged failure of reciprocity in electro-acoustical systems. Frederick V. Hunt. [HUSL.] November 30, 1942.

M2 Results of reciprocity calibration as applied to hebbphone No. 4. Robert L. Cummerow. [HUSL.] May 12, 1943.

M3 First reciprocity measurements at Spy Pond. Roland E. Mueser. [HUSL.] September 21, 1943.

M4 The 4th and 5th reciprocities at Spy Pond, and summary. Roland E. Mueser. [HUSL.] November 15, 1943.

M5 Reciprocity of linear electromechanical systems. Malcolm H. Hebb. [HUSL.] December 8, 1943.

M6 Broad frequency reciprocity calibration of standards. Roland E. Mueser. [HUSL.] February 16, 1944.

612.52 Facilities

M1 Status of *Barge* plans. Robert L. Cummerow. [HUSL.] March 10, 1943.

M2 Spy Pond equipment. Paul Ebaugh. HUSL. July 8, 1943.

M3 Absorbent-lined tank for sonic gear monitor tests. Paul E. Sabine. [HUSL.] August 16, 1943.

M4 Suggested simplifications in testing at Spy Pond. Roland E. Mueser. [HUSL.] January 21, 1945.

M5 Suggestions for layout and handling gear at the Penn State Measurement Station. Paul Ebaugh. [HUSL.] February 7, 1945.

M6 Comments on: Suggestions for layout and handling gear at the Penn State Measurement Station. Francis P. Bundy. [HUSL.] February 20, 1945.

M7 Suggestions on Penn State Measurement Station. Roland E. Mueser. [HUSL.] March 14, 1945.

M8 Black Moshannon. A. Nelson Butz, Jr. [HUSL.] May 19, 1945.

M9 Spy Pond standards. ([Memorandum] B.) Roland E. Mueser. [HUSL.] June 6, 1945.

M10 Electronic layout for Black Moshannon. Paul Ebaugh. [HUSL.] June 21, 1945.

612.53 Instruments

M1 Mechanical driver for testing 3-inch x 5-inch magnetostriction hydrophone. (Report No. D16.2/3716.) Walter L. Widlar. NLL. August 17, 1942.

M2 Bell Laboratories' absorbent-lined tank. Kenneth N. Fromm and Paul E. Sabine. [HUSL.] March 9, 1943.

M3 Markers for frequency scale in measurement set-up. O. Hugo Schuck. [HUSL.] April 5, 1943.

M4 Standard pressure gradient hydrophone. (Report Nos. D-173204 and D-173206.) Eginhard Dietze. BTL. May 3, 1943.

M5 Comparison of data taken at *Barge* and fur-lined bathtub. Robert B. Watson. [HUSL.] June 14, 1943.

M6 Amplifier and power supply for Harvard Laboratory. (Report No. G30/R569.) Frank P. Herrnfeld

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and Sylvester J. Haefner. NLL. October 25, 1943.

M7 Sound apparatus recorders. John F. Hersh. [HUSL.] December 10, 1943.

M8 Directional pattern tracer. Robert B. Watson. [HUSL.] January 19, 1944.

M9 New London measuring amplifier. Henry Newburg. [HUSL.] February 2, 1944.

M10 New London measuring amplifier. Fred H. Smith. [HUSL.] February 3, 1944.

M11 A power amplifier and bridge for the measurement of impedance at high-power level. (Report No. P35/R653.) Sylvester J. Haefner. NLL. February 15, 1944.

M12 Development of bridge circuits for the measurement of the transducer characteristics. Robert E. Payne. [HUSL.] April 21, 1944.

M13 New thermal wattmeter. Mountain Lakes design. Jack C. Cotton. [HUSL.] May 3, 1944.

M14 A secondary tuning fork frequency standard and harmonic generator. Paul Ebaugh. [HUSL.] May 15, 1944.

M15 Fairprene for absorbent tank linings. Paul E. Sabine. HUSL. July 26, 1944.

M16 The varistor conductometer. John F. Hersh and James J. Faran, Jr. [HUSL.] September 20, 1944.

M17 Artificial transducers for scanning sonar. Robert E. Payne. [HUSL.] October 30, 1944.

M18 The conductometer. James J. Faran, Jr. [HUSL.] November 17, 1944.

M19 Portable polar chart recorder. (n.a.) Service Project No. NS-142. HUSL. December 1, 1944.

M20 The vector impedance locus plotter. John F. Hersh and James J. Faran, Jr. [HUSL.] March 2, 1945.

M21 Design of potentiometer phase shifter for phase measurements over a broad frequency band. Robert L. Cummerow. [HUSL.] March 5, 1945.

M22 Vector impedance locus plotter. (n.a.) OEMsr-287; Section No. 6.1-sr287-2175. HUSL. March 15, 1945.

M23 Polar pattern plotting at Penn State. Harvey A. Brooks. [HUSL.] March 23, 1945.

M24 Wetting agents. Paul Ebaugh. [HUSL.] June 29, 1945.

M25 Brief description of the circuit and performance of the last adaptation of the Shepard phase meter, Model 2 No. 1, undertaken at Harvard Underwater Sound Laboratory. Robert L. Cummerow. [HUSL.] July 2, 1945.

612.54 Transducer Standards

M1 Hydrophonic instruments. (Report No. 2240-AHI-VD.) A. H. Inglis. BTL. December 13, 1941.

M2 Operating instructions for 2A and 3A projectors. (n.a.) BTL. December 7, 1942.

M3 Temperature dependence of our 6-inch x 6-inch X-cut crystal projector. Precision of *Barge* measurements. Paul E. Sabine. [HUSL.] June 22, 1943.

M4 Sensitivity of standard hydrophone. Paul E. Sabine. [HUSL.] September 23, 1943.

M5 Magnetostriction dual-purpose projectors for Moshannon Test Station. Roland E. Mueser and John R. Reitz. [HUSL.] April 18, 1945.

M6 Reply to memorandum, April 18, 1945 [from] Mueser and Reitz: Magnetostriction dual-purpose projectors for Black Moshannon Test Station. Paul Ebaugh. [HUSL.] April 24, 1945.

612.55 Transducer Characteristics

M1 Intercomparison of microphones between MIT Project DIC-5985 and other groups. (Report [covering period from] January 1, 1941 to February 24, 1942.) (n.a.) MIT. February 24, 1942.

M2 Characteristics of GB5-2 and C-26 transducers. (Report No. G12/R298.) Edward Gerjuoy. NLL. April 22, 1943.

M3 Orlando calibration of proposed Mark 24 mine microphone. Lyman N. Miller. [HUSL.] June 17, 1943.

M4 Results of Spy Pond tests on waffle iron EP transducer. Nelson K. Moody, Jr. HUSL. September 21, 1943.

M5 Measurements of 5-inch toroidally-wound magnetostriction hydrophones. (Report No. D16/R557.) Edward Gerjuoy. NLL. October 20, 1943.

M6 Seat tests of JP-1 hydrophone. (Report No. G12/R581.) Albert L. Thuras, Ralph C. Maninger and Hector F. Bernier. NLL. November 1, 1943.

M7 Measurements of JP hydrophones. (Report No. G12/R597.) Edward Gerjuoy. NLL. November 8, 1943.

M8 JP-1 hydrophone vibration measurement. (Report No. G12/R620.) Albert L. Thuras and Hector F. Bernier. Service Project No. NS-113. NLL. November 23, 1943.

M9 Measurements of two JP-1 hydrophones with NL-105, No. 4 amplifier. (Report No. G12/R664.) Edward Gerjuoy. NLL. December 27, 1943.

M10 Measurements of two-section three-foot hydrophones. (Report No. G12/R683.) Edward Gerjuoy. NLL. January 11, 1944.

M11 The complete magnetization of the JP-1 hydrophone. (Report No. D24/G12/R727.) Edward Gerjuoy. Service Project Nos. NS-113 and NS-139. NLL. January 31, 1944.

M12 Special hydrophones for range and bearing studies. (Report No. G12/R746.) Wilbur T. Harris. Service Project No. NS-139. NLL. February 15, 1944.

M13 Depth charge tests on hydrophones. Effect of annealing on performance. (Report No. G12/R754.) Wilbur T. Harris, Phillip B. Edwards and Robert R. MacLaughlin. Service Project No. NS-139. NLL. March 14, 1944.

M14 Preliminary survey of the analysis of the impedance and admittance data on the HP-II stacks. Robert E. Payne. [HUSL.] April 6, 1944.

M15 Results of the analysis of the admittance data on the individual HP-II stacks, including the selec-

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tion and arrangement of the elements in HP-II, No. 1-B. Robert E. Payne. [HUSL.] April 13, 1944.

M16 Tests and analysis of British scanning sonar transducer element. Francis P. Bundy. [HUSL.] October 25, 1944.

M17 Field of Q-P No. 2 in May and June, 1945. John R. Reitz. [HUSL.] June 7, 1945.

612.6 Radially-Vibrating Transducers

M1 Two "thimble" hydrophones. (Report No. G12/R779.) Wilbur T. Harris. Service Project No. NS-102. NLL. March 6, 1944.

M2 Midget element magnetostriction hydrophones. (Report No. G12/R889.) Wilbur T. Harris, Phillip B. Edward and David W. Van Lennep. NLL. May 23, 1944.

M3 The 40-PR No. 1. John R. Reitz and Roland E. Mueser. [HUSL.] August 14, 1945.

M4 Future work in the parabolic reflector field. John R. Reitz and Roland E. Mueser. [HUSL.] August 20, 1945.

M5 The 40-PR No. 2, esplanadephone. John R. Reitz and Roland E. Mueser. [HUSL.] August 20, 1945.

612.61 Laminated Ring Stacks

M1 Information on B-27A, Nos. 1 and 2, 39-kc nickel ring stack transducer. Francis P. Bundy. [HUSL.] May 12, 1943.

M2 Results of tests on cyclewelded 20-kc ring stack. Francis P. Bundy. [HUSL.] October 14, 1943.

M3 Tests of the large 4-segment 20-kc ring stack. Francis P. Bundy. [HUSL.] October 21, 1943.

M4 Measurements on 1/4-inch 20-kc ring stack. James W. Follin, Jr. [HUSL.] November 20, 1943.

M5 Performance of the 60-kc ring stacks H-9 and H-10, individually and in combination. Jack C. Cotton and Francis P. Bundy. [HUSL.] November 23, 1943.

M6 Ring stacks, Response of arrays of Frederick V. Hunt. HUSL. November 29, 1943.

M7 Performance of the 60-ARS-1 and -2 ring stacks. Jack C. Cotton and Francis P. Bundy. [HUSL.] December 1, 1943.

M8 Tests on lucite-impregnated 60-kc ring stacks. Jack C. Cotton and Francis P. Bundy. [HUSL.] March 11, 1944.

M9 Self-polarized ring stacks. Francis P. Bundy and Gerard W. Renner. [HUSL.] May 9, 1944.

M10 Construction and performance of 60-kc echo repeater transducer, Pair No. 3. Francis P. Bundy and Milton R. Carlson. [HUSL.] May 24, 1944.

M11 Plastic casting of ring stack transducers. Gerard W. Renner and Alan H. Selker. [HUSL.] August 29, 1944.

M12 Control of pattern of a radially-vibrating transducer. Paul E. Sabine. [HUSL.] September 22, 1944.

M13 [The] 24.5-kc spherical source No. 3, delivered

September 22, 1944. Gerard W. Renner. [HUSL.] September 22, 1944.

M14 [The] 24.5-kc spherical source No. 4, delivered October 6, 1944. Gerard W. Renner. [HUSL.] October 9, 1944.

M15 [The] 60-kc 2-VP-1, No. 1 [ring stack]. Gerard W. Renner. [HUSL.] October 24, 1944.

M16 [The] 24.5-kc spherical source transducers, Nos. 5 and 6. Gerard W. Renner. [HUSL.] October 27, 1944.

M17 [The] 26-kc projectors for *Aide de Camp*. Gerard W. Renner. HUSL. November 2, 1944.

M18 Tests on thin-walled 2-V permendur 60-kc ring stack. Francis P. Bundy. [HUSL.] November 2, 1944.

M19 [The] 60-kc 2-VP-1, No. 2 [ring stack]. Gerard W. Renner. [HUSL.] November 16, 1944.

M20 [The] 60-ARS No. 10 [ring stack]. Gerard W. Renner. [HUSL.] November 20, 1944.

M21 [The] 60-kc 2-VP spherical source No. 1 [ring stack]. Gerard W. Renner. [HUSL.] December 5, 1944.

M22 Low-frequency thin-walled 2-VP ring stacks. Gerard W. Renner. [HUSL.] January 18, 1945.

M23 [The] 60-kc 2-VP spherical source No. 3 [ring stack]. Gerard W. Renner. [HUSL.] February 2, 1945.

M24 [The] 24.5-kc 2-V permendur spherical source transducer No. 7 [ring stack]. Gerard W. Renner. [HUSL.] February 26, 1945.

M25 [The] 24.5-kc 2-VP spherical source No. 8 [ring stack]. Gerard W. Renner. [HUSL.] February 28, 1945.

M26 [The] 60-kc 2-VP spherical source No. 2 [ring stack]. Gerard W. Renner. [HUSL.] March 21, 1945.

M27 Plastic cast 2-VP ring stack projector for 25.5-kc use. Gerard W. Renner. [HUSL.] April 10, 1945.

M28 [The] 24.5-kc 2-VP spherical source, Nos. 9 and 10 [ring stacks]. Gerard W. Renner. [HUSL.] April 16, 1945.

M29 Transducer construction in the low-frequency self-contained echo repeater, Model II. Milton R. Carlson. [HUSL.] May 5, 1945.

612.611 B-19B

M1 Characteristics of B-19 sonic gear monitor transducer. Francis P. Bundy. [HUSL.] June 7, 1943.

M2 [Portable sonic gear monitor transducers.] Francis P. Bundy. [HUSL.] June 10, 1943.

M3 Sensitivity of B-19B sonic gear monitor transducer. Francis P. Bundy. [HUSL.] June 15, 1943.

M4 Suggestions on procedures for testing sonic gear monitor transducers as they proceed through the production line. Francis P. Bundy. [HUSL.] July 29, 1943.

M5 Tests of the first of Harvey Radio Laboratories'

- B-19B transducer. Francis P. Bundy. [HUSL.] September 28, 1943.
- M6** Performance tests on sonic gear monitor Model 50, Serial No. 2, with B-19B No. 26 hydrophone. Paul E. Sabine. [HUSL.] October 7, 1943.
- M7** VIR teardrop transducer for installed sound gear monitor. Francis P. Bundy. [HUSL.] October 22, 1943.
- M8** Data on B-19B hydrophones. Paul E. Sabine. [HUSL.] January 14, 1944.
- M9** Tests on twenty-two B-19B hydrophones made by Harvey Radio Laboratories. Paul E. Sabine. [HUSL.] January 29, 1944.
- M10** Effect of depth and depth charges on a B-19B hydrophone. Paul E. Sabine. [HUSL.] February 15, 1944.
- M11** Monitor transducer failures. Fred H. Smith. [HUSL.] February 15, 1944.
- M12** Field and frequency response sheet for B-19B, No. 18, standard. Simplified conversion procedure. Jack C. Cotton. [HUSL.] February 29, 1944.
- M13** Temperature variation in sensitivity of B-19B hydrophones. Paul E. Sabine. [HUSL.] March 6, 1944.
- M14** Magnetostriction beeper listening hydrophone. R. Warren Marsh. [HUSL.] April 19, 1944.
- M15** Measurements on two B-19B hydrophones to be used as secondary standard for production tests on OAX-1 monitors by Harvey Radio Corporation. Paul E. Sabine. [HUSL.] May 11, 1944.
- M16** Sensitivity and pattern measurements on five monitor hydrophones submitted by Presto Recording Corporation. Paul E. Sabine. [HUSL.] June 8, 1944.
- M17** Testing of B-19B transducers at Presto Recording Corporation. Francis P. Bundy. [HUSL.] June 28, 1944.
- M18** [Comparison of Harvard Underwater Sound Laboratory and Presto pattern and sensitivity measurements on Presto hydrophones.] Paul E. Sabine. [HUSL.] July 24, 1944.
- M19** Recent measurements on standard hydrophones, B-19B, No. 18; B-19H, No. 2 and B-19B, No. 1. Paul Ebaugh. [HUSL.] August 4, 1944.
- M20** Sensitivities of B-19B, No. 6 and B-19H, No. 1 standard hydrophones used at the Barge. Louis Fein and Aaron B. Powers. [HUSL.] September 20, 1944.
- M21** Acoustical measurements on B-19B, No. 123. Paul E. Sabine. [HUSL.] October 31, 1944.
- M22** Sensitivities of B-19B, No. 6 and QP-2. Louis Fein and Nelson M. Blachman. [HUSL.] February 7, 1945.
- M23** Tests on beeper listening hydrophones. Paul E. Sabine. [HUSL.] February 28, 1945.
- M24** Test on beeper listening hydrophones. Paul E. Sabine. [HUSL.] April 20, 1945.
- 612.612 B-19D, -F and -G**
- M1** [The] B-19G, No. 1 transducer. Gerard W. Renner. [HUSL.] January 24, 1944.
- M2** Installed sonic gear monitor transducer B-19D, No. 4 in VIR teardrop shell. Francis P. Bundy and Jack C. Cotton. [HUSL.] January 28, 1944.
- M3** Recalibration of B-19F hydrophone. Paul E. Sabine. [HUSL.] August 11, 1944.
- 612.613 B-19H**
- M1** [The] B-19H transducers. John R. Reitz. [HUSL.] February 21, 1944.
- M2** Installed sonic gear monitor transducer, B-19H, in VIR pit-log strut extension. John R. Reitz. [HUSL.] March 16, 1944.
- M3** [The] B-19H transducers. ([Memorandum] II.) John R. Reitz. [HUSL.] April 13, 1944.
- M4** Effect of hanging weights from the bottom of monitor transducers. John R. Reitz. [HUSL.] April 17, 1944.
- M5** [The] B-19H expanded range monitor. John R. Reitz. [HUSL.] May 12, 1944.
- M6** Procedure for assembly of B-19H expanded range monitor hydrophones. John R. Reitz. [HUSL.] June 13, 1944.
- M7** Construction of B-19H transducers in the transducer shop. John R. Reitz. [HUSL.] August 1, 1944.
- M8** Overload pressure on a B-19H type transducer. Louis Fein and Aaron B. Powers. [HUSL.] August 4, 1944.
- M9** Characteristics of B-19H hydrophone used as projector. Paul E. Sabine and Paul Ebaugh. [HUSL.] August 7, 1944.
- M10** Use of B-19H hydrophones as projectors. Frederick V. Hunt. [HUSL.] August 9, 1944.
- M11** [The] B-19H standard transducers. Production tests. John R. Reitz. [HUSL.] October 31, 1944.
- M12** Hydrophone specification for X-OCP monitors. John R. Reitz. [HUSL.] December 18, 1944.
- M13** Use of filament heater for soldering and design of new soldering jig for B-19H. John R. Reitz and Alan H. Selker. [HUSL.] December 19, 1944.
- M14** Pit-log strut hydrophone. Conclusions and recommendations. John R. Reitz. [HUSL.] February 21, 1945.
- M15** [The] B-19H hydrophone specifications. John R. Reitz. [HUSL.] April 5, 1945.
- M16** High-pressure test of three B-19H hydrophones. John R. Reitz. [HUSL.] April 9, 1945.
- M17** High-pressure tests on B-19H hydrophones. Paul E. Sabine. [HUSL.] May 9, 1945.
- M18** Results of tests on eleven David Bogen OBY hydrophones. John R. Reitz. [HUSL.] May 25, 1945.
- 612.614 B-19J**
- M1** [The] B-19J hydrophones. John R. Reitz. [HUSL.] November 29, 1944.
- M2** Recent tests on B-19J hydrophones. John R. Reitz. [HUSL.] June 8, 1945.
- 612.615 B-19K**
- M1** Sensitivity of B-19K, No. 1 standard hydrophone

used at the *Barge*. Louis Fein and L. Curtis Foster. [HUSL.] October 17, 1944.

M2 Sensitivity of B-19K, No. 1. Louis Fein. [HUSL.] December 8, 1944.

M3 [The] B-19K hydrophone for low-frequency monitoring. John R. Reitz. [HUSL.] January 26, 1945.

612.616 B-19L

M1 Experiment in alteration of the baffle of a B-19L beeper listening hydrophone. Francis P. Bundy. [HUSL.] May 4, 1945.

612.62 Tube Hydrophones

M1 Listening tests on Thuras "doughnut" hydrophones. (Report No. G12/2679.) Donald P. Loye. NLL. April 30, 1942.

M2 Magnetostriction microphone. Disclosure of invention. (Report No. G5/2625.) Albert L. Thuras. NLL. May 2, 1942.

M3 Present status of the development of line microphones. (Report No. G12/3129.) J. Warren Horton. NLL. June 13, 1942.

M4 Thuras-type microphones at 100 kc and 1 mc. Malcolm H. Hebb. [HUSL.] December 1, 1942.

M5 Tubular magnetostriction hydrophone with cylindrical internal coil. (Report No. G27/R131.) Hector F. Bernier. NLL. December 18, 1942.

M6 Development of magnetostriction hydrophones, July 1, 1942 to April 1, 1943. (Report No. G12/R158.) Albert L. Thuras. OEMsr-20; Section No. 6.1-sr20-639. NLL. [1943.]

M7 Notes and observations from lecture by Albert L. Thuras at New London, March 24, 1943. Francis P. Bundy. [HUSL.] April 3, 1943.

M8 Tests on small straight magnetostriction hydrophones constructed with electroformed shells. (Report No. D16/R315.) Robert R. MacLaughlin. NLL. May 18, 1943.

M9 Type tests on AN/CRT-1 units, second group. (Report No. D16/R376.) Henry N. Jasper, Jr. Service Project No. NS-106. NLL. May 19, 1943.

M10 Straight toroidally-wound magnetostriction hydrophone, TMS-53. (Report No. G12/R394.) James W. Follin, Jr. NLL. June 8, 1943.

M11 Tests on small hydrophones, for expendable radio sono buoy, submitted by Aircraft Radio Laboratory. (Report No. D16/R433.) Robert R. MacLaughlin. Service Project No. NS-106. NLL. July 16, 1943.

M12 Line source transducer and possible sonar application. Roland E. Mueser. [HUSL.] July 30, 1943.

M13 Proposed changes in D16, Mark IV-E hydrophone. (Report No. D16/R467.) Robert R. MacLaughlin. NLL. August 3, 1943.

M14 Tests on twenty expendable radio sono buoy hydrophones. (Report No. D16/R496.) Edward Gerjuoy and Robert R. MacLaughlin. NLL. September 3, 1943.

M15 Methods of constructing layer-built magnetostrictive tubes to be used as radial oscillators. Francis P. Bundy. [HUSL.] September 30, 1943.

M16 Tests on ten Series C expendable radio sono buoy hydrophones. (Report No. D16/R536.) Edward Gerjuoy and Robert R. MacLaughlin. NLL. October 1, 1943.

M17 Bearing accuracy of 3-ft, 2-ft and 1-ft straight magnetostriction hydrophones. (Report No. D17/R543.) Ralph C. Maninger. NLL. October 9, 1943.

M18 Measurements of three-foot straight wood core hydrophone, D546-6 and D546-7. (Report No. G12/R547.) Edward Gerjuoy and Frank M. Goyan. NLL. October 15, 1943.

M19 Performance of the JP baffle at supersonic frequencies. (Report No. G12/R643.) Edward Gerjuoy. NLL. December 11, 1943.

M20 Improved preamplifier mounting of OAY sound level meter hydrophone. (Report No. P35/R679.) Garland W. Archer. Service Project No. NO-163. NLL. January 11, 1944.

M21 The complete magnetizing of a 3-foot toroidally-wound magnetostriction hydrophone. (Report No. G12/R691.) Wilbur T. Harris and Edward Gerjuoy. Service Project No. NS-139. NLL. January 14, 1944.

M22 Effect of tape ties upon the acoustic functioning of the M-7/CRT-1A hydrophone. (Report No. D16/R798.) Robert R. MacLaughlin, David W. Van Lennep and Henry Suter. Service Project No. NS-106. NLL. March 20, 1944.

M23 Permanent magnet core blastphone. (Report No. G12/R853.) Albert L. Thuras. NLL. April 6, 1944.

M24 General purpose non-directional sonic magnetostriction hydrophones. (Report No. G12/R852.) Wilbur T. Harris, David W. Van Lennep and Phillip B. Edwards. NLL. April 10, 1944.

M25 A permanent magnet magnetostriction hydrophone construction. (Report No. G12/R858.) Wilbur T. Harris and David W. Van Lennep. NLL. April 12, 1944.

M26 The hydrophone, H-115. (Report No. G12/R929.) Wilbur T. Harris and David W. Van Lennep. NLL. May 19, 1944.

M27 Comparative tests on 3-ft, 4-ft and 5-ft hydrophones. (Report No. P33/R949.) Ralph C. Maninger. NLL. June 12, 1944.

M28 The straight toroidally-wound plastic-covered magnetostriction hydrophone. (Report No. G12/R804.) Wilbur T. Harris. OEMsr-1128; Section No. 6.1-sr1128-1573. NLL. June 15, 1944.

M29 Tubular magnetostrictive transducer consisting of helix of fine nickel tubing. Nelson M. Blachman and Malcolm H. Hebb. [HUSL.] July 1, 1944.

M30 Elimination of longitudinal resonance in the straight magnetostriction hydrophone. (Report No.

- G12/R1014.) Hector F. Bernier. NLL. July 7, 1944.
- M31** Preliminary specification for the NL-124 hydrophone of the D-55 sonar system. (Report No. D55/R966.) (n.a.) NLL. July 21, 1944.
- M32** The modified baffle for topside straight hydrophones. (Report No. G12/R1010.) James W. Follin, Jr. NLL. August 12, 1944.
- M33** Tests on six NL-130 hydrophones. (Report No. D50/R1110.) David W. Van Lennep. Service Project No. NS-238. NLL. September 4, 1944.
- M34** Measurements on New London permanent magnet hydrophone, H-192. Paul E. Sabine and Louis Fein. [HUSL.] September 7, 1944.
- M35** Five-foot split JP-1 type permanent magnet hydrophone, TMS-97. (Report No. G12/R1125.) Albert L. Thuras. NLL. September 14, 1944.
- M36** Operation of topside sonic gear on *USS Blueback*. (Report No. G12/R1127.) Albert L. Thuras. NLL. September 18, 1944.
- M37** Magnetostriction hydrophone design. (Report No. G12/R1137.) Albert L. Thuras. NLL. September 21, 1944.
- M38** Tests of an improved JP-1 type hydrophone on the *USS Blueback*. (Report No. P33/R1161.) Albert L. Thuras. Service Project No. NS-113. NLL. October 3, 1944.
- M39** Tests on two COG-51053, JP-1, hydrophones in NL-109 baffles removed from *USS Sargo* and *USS Gabilain*. (Report No. D24/R1243.) David W. Van Lennep and Wilbur T. Harris. NLL. November 17, 1944.
- M40** Tests on NL-124 hydrophones manufactured by Astatic Corporation. (Report No. G12/R1284.) David W. Van Lennep and Wilbur T. Harris. Service Project No. NS-102. NLL. December 15, 1944.
- M41** A permanent magnet magnetostriction hydrophone construction. (Report No. G12/R1248.) Wilbur T. Harris. OEMsr-1128; Service Project No. NS-102; Section No. 6.1sr1128-1921. NLL. December 20, 1944.
- M42** An experimental streamlined baffle for two hydrophones. (Report No. G12/R1327.) Wilbur T. Harris and David W. Van Lennep. Service Project No. NS-102. NLL. February 9, 1945.
- M43** Permanent magnet sonic projectors. (Report No. G27/R1353.) Wilbur T. Harris, Phillip B. Edwards and David W. Van Lennep. Service Project No. NS-102. NLL. February 11, 1945.
- M44** A new end fitting design for NL-124 and NL-130 hydrophones. (Report No. G12/R1373.) Wilbur T. Harris and Phillip B. Edwards. Service Project No. NS-102. NLL. February 24, 1945.
- M45** Underwater sonic loudspeaker. (Report No. G13/R1352.) Albert L. Thuras. OEMsr-1128; Service Project No. NS-182; Section No. 6.1-sr1128-1936. NLL. April 24, 1945.
- M46** Testing specification for toroidal hydrophone. (Report No. D22.6/3615.) (n.a.) NLL. (n.d.)
- 612.63 Laminated Scrolls**
- M1** Laminated magnetostriction tubes. Malcolm H. Hebb. [HUSL.] November 7, 1942.
- M2** [The] MOX and MKX magnetostriction hydrophones. (Report No. 2210-RLP-MS.) [R. L. Peek.] BTL. June 10, 1943.
- M3** Criticism of MOX and MKX magnetostrictive hydrophones. Lyman N. Miller. [HUSL.] August 19, 1943.
- M4** Bell Telephone Laboratories' magnetostrictive brainstorm, Type MKX. Frederick V. Hunt. [HUSL.] August 30, 1943.
- M5** Scroll stack transducer, April 18, 1944. John D. Lane. [HUSL.] April 19, 1944.
- M6** Scroll transducer project. John D. Lane. [HUSL.] June 17, 1944.
- 612.7 Longitudinally-Vibrating Transducers**
- M1** Preliminary impedance measurements which led to the design of the honeycomb, 19 element, transducer. Paul M. Kendig. [HUSL.] September 20, 1943.
- 612.71 Laminated Stacks**
- M1** Laminated stack transducer. O. Hugo Schuck. [HUSL.] September 2, 1942.
- M2** Laminated projectors. Frederick V. Hunt. [HUSL.] November 10, 1942.
- M3** Winding for 9-inch x 9-inch asymmetrical laminated stack. O. Hugo Schuck. [HUSL.] December 5, 1942.
- M4** The 9-inch x 9-inch tests to be made at *Barge*. Patterns, frequency response [and] absolute calibration. Robert L. Cummerow. [HUSL.] January 21, 1943.
- M5** Completing of Mark II, 9-inch x 9-inch asymmetrical stack of .005-inch nickel punchings. Francis P. Bundy. [HUSL.] January 26, 1943.
- M6** Efficiency measurements of the Mark I hugophone. Paul E. Sabine. [HUSL.] February 4, 1943.
- M7** Tests on the hebbphone. Roderic M. Scott. [HUSL.] March 18, 1943.
- M8** Information on the Mark I, 9-inch x 9-inch asymmetric laminated stack hydrophone. Leon W. Camp, Francis P. Bundy and Paul E. Sabine. [HUSL.] May 29, 1943.
- M9** Winding and circuit diagram of the 9-inch x 9-inch asymmetric stack, Mark II hydrophone. Leon W. Camp. HUSL. June 10, 1943.
- M10** Interlaced transducer for sonar. J. Lewis Hathaway. [HUSL.] July 15, 1943.
- M11** Interleaved transducer for sonar. San Diego echo repeaters. Roderic M. Scott. [HUSL.] July 21, 1943.
- M12** Sonar test and analysis of laminated transducer element. James W. Follin, Jr., Robert A. Payne and Malcolm H. Hebb. [HUSL.] September 17, 1943.
- M13** Magnetic polarization of the Drisko T. Francis P. Bundy. HUSL. September 30, 1943.

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- M14** Transducers, Thoughts on laminated. Eric A. Walker. [HUSL.] October 25, 1943.
- M15** Transducers, Thoughts on laminated. Frederick V. Hunt. HUSL. October 25, 1943.
- M16** Laminated transducers, Further thoughts on. Francis P. Bundy. [HUSL.] November 2, 1943.
- M17** Sonar transducer. Certain measurements and recommendations. F. Burton Jones. [HUSL.] November 16, 1943.
- M18** Thoughts on design of transducers for an 80-kc sonar system. Francis P. Bundy. [HUSL.] December 7, 1943.
- M19** Remarks on suggested design of transducers for high-frequency sonar systems. Roderic M. Scott. [HUSL.] December 11, 1943.
- M20** Answers to questions in Scott's memorandum of December 11, regarding high-frequency sonar transducers. Francis P. Bundy. [HUSL.] December 15, 1943.
- M21** A study of the behavior of consolidated and unconsolidated stack transducers in castor oil and in water. Leon W. Camp and Francis P. Bundy. [HUSL.] January 13, 1944.
- M22** Concluding report on bookphones. Gerard W. Renner. [HUSL.] February 7, 1944.
- M23** Efficiencies of consolidated and unconsolidated stack transducers in castor oil and in water. Francis P. Bundy and Leon W. Camp. OEMsr-287; Section No. 6.1-sr287-1356. HUSL. February 10, 1944.
- M24** Design, construction and performance of the Drisko T transducer. Benjamin B. Drisko. [HUSL.] February 28, 1944.
- M25** Sonar transducer proposals. John D. Lane. [HUSL.] April 4, 1944.
- M26** Coupling tests on ladderphone stacks. Frederick V. Hunt. [HUSL.] April 10, 1944.
- M27** Stepped-frequency transducers. Gerard W. Renner and Francis P. Bundy. [HUSL.] May 4, 1944.
- M28** Sonar lamination dimensions as functions of the number of sections. Nelson M. Blachman. [HUSL.] June 26, 1944.
- M29** The construction and performance of the Whale transducer. Milton R. Carlson and Francis P. Bundy. [HUSL.] July 16, 1944.
- M30** Transducer nomenclature. (Part II.) Cedric E. Hesthal. [HUSL.] August 24, 1944.
- M31** Lamination cleaning. Jack C. Cotton. [HUSL.] December 1, 1944.
- M32** Submarine bottom side transducer. Hugh E. Harlow. [HUSL.] January 4, 1945.
- M33** Present bad terminology relating to diameter of scanning transducers. Malcolm H. Hebb. [HUSL.] February 8, 1945.
- M34** Technical literature for indoctrination of prospective manufacturers of QH sonar transducers. Francis P. Bundy. [HUSL.] March 6, 1945.
- 612.711 Hebbphone No. 1**
- M1** Sonar magnetostrictive transducer. Frederick V. Hunt. [HUSL.] July 14, 1943.
- M2** The problem of sonar transducers. Roderic M. Scott. [HUSL.] July 17, 1943.
- M3** Change of resistance to ground of the 36-element transducer. Roderic M. Scott. [HUSL.] July 23, 1943.
- M4** Tests on the 36-element hebbphone [No.] 1 transducer. Thomas P. Merritt, Harold P. Knauss and Arthur C. Clatfelter. [HUSL.] December 30, 1943.
- M5** Proposed tests for HP-1 transducer. Francis P. Bundy. [HUSL.] March 27, 1944.
- M6** That which is rotten with HP-1. Stanley R. Rich and David C. Whitmarsh. [HUSL.] April 21, 1944.
- M7** Comparison tests on hebbphone [No.] 1 and hebbphone [No.] 2. Thomas P. Merritt, Francis P. Bundy and others. [HUSL.] May 2, 1944.
- M8** Transmission directivity indices of hebbphone [No.] 1, hebbphone [No.] 2-B and other similar hydrophones. F. Burton Jones. [HUSL.] September 21, 1944.
- 612.712 Hebbphone No. 2**
- M1** Lamination for Model 2 sonar transducer. Malcolm H. Hebb. [HUSL.] July 30, 1943.
- M2** [The] No. 2 sonar transducer element. Francis P. Bundy. [HUSL.] September 10, 1943.
- M3** Tests on Model No. 2 sonar transducer. James W. Follin, Jr. and Malcolm H. Hebb. [HUSL.] October 7, 1943.
- M4** Results of comparison tests on Campbell and Murphy 10 mil 2-inch stacks. Thomas P. Merritt. [HUSL.] February 1, 1944.
- M5** Performance of HP-2, No. 1 on *USS Sardonyx*. Cedric E. Hesthal. [HUSL.] March 4, 1944.
- M6** Construction and first tests of the HP-1, No. 1 transducer. Francis P. Bundy, Cedric E. Hesthal and others. [HUSL.] March 21, 1944.
- M7** Tests on 2-inch HP-2 stacks. Thomas P. Merritt and Francis P. Bundy. [HUSL.] May 3, 1944.
- M8** Acoustic patterns of the HP-2B scanning sonar transducer on the *USS Cythera*. Harold P. Knauss, Aaron B. Powers and Francis P. Bundy. [HUSL.] October 10, 1944.
- 612.713 Hebbphone No. 3**
- M1** [Assembly of HP-3 stacks.] Leon W. Camp. [HUSL.] July 13, 1944.
- M2** Consolidation of HP-3 laminations. Leon W. Camp. [HUSL.] July 15, 1944.
- M3** Assembly of HP-3 stacks. (Supplementary Memorandum of July 13, 1944.) Leon W. Camp. [HUSL.] July 24, 1944.
- M4** Specifications for consolidation and winding of laminations. Leon W. Camp. [HUSL.] August 24, 1944.

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- M5 Harvey Radio [Corporation's] first HP-3 stack. Francis P. Bundy. [HUSL.] September 6, 1944.
- M6 Impedance of HP-3 stacks. Francis P. Bundy. [HUSL.] October 5, 1944.
- M7 Capacitive commutators. F. Burton Jones and Reubin H. Wallace. [HUSL.] October 5, 1944.
- M8 Cyclewelding of HP-3 stacks. Paul E. Sabine. [HUSL.] October 28, 1944.
- M9 Construction and first tests of the magnetostrictive scanning sonar transducer HP-3DS. Robert B. Watson and Francis P. Bundy. [HUSL.] December 13, 1944.
- M10 HP-3 stacks submitted by Harvey Radio Corporation. Leon W. Camp. [HUSL.] December 29, 1944.
- M11 Measurements on HP-3DS as installed on *USS Cythera*. Robert B. Watson. [HUSL.] March 3, 1945.
- M12 Measurements on HP-3DS as installed on *USS Cythera*. Robert B. Watson. [HUSL.] March 10, 1945.
- M13 Turkshead covering for HP-3S. Cedric E. Hesthal. [HUSL.] March 19, 1945.
- M14 Outline of tests suggested for HP-3. Francis P. Bundy. [HUSL.] March 24, 1945.
- M15 Repair of HP-3DS, No. 1 transducer. Nat H. Godbold. [HUSL.] April 5, 1945.
- M16 Tests of HP-3, No. 1 transducer. Marvin J. Foral and Francis P. Bundy. HUSL. May 23, 1945.

612.714 Hebbphone No. 5

- M1 QH Sonar. Depression of beam. Malcolm H. Hebb. [HUSL.] June 19, 1944.
- M2 Construction and testing of HP-5 transducer stacks at the Sangamo Electric Company. Francis P. Bundy and James J. Faran, Jr. [HUSL.] August 21, 1944.
- M3 Tests on five Sangamo HP-5 transducer stacks. Francis P. Bundy. [HUSL.] September 8, 1944.
- M4 Tests on six Sangamo HP-5 transducer stacks. Francis P. Bundy. [HUSL.] October 14, 1944.
- M5 Dome for ultimate sonar transducer. Hugh E. Harlow. [HUSL.] November 3, 1944.
- M6 Water seal for 100-conductor sonar cable. Alan H. Selker. [HUSL.] December 6, 1944.
- M7 Plans for testing HP-5 Sangamo assembly at *Barge*. Francis P. Bundy. [HUSL.] January 17, 1945.
- M8 Final tests on Sangamo HP-5, No. 1 transducer before installation on the *Galaxy*. Francis P. Bundy. [HUSL.] February 27, 1945.
- M9 Tests on Sangamo HP-5, No. 3 transducer. Cedric E. Hesthal and Francis P. Bundy. [HUSL.] March 9, 1945.
- M10 Tests on Sangamo HP-5, No. 4 transducer. Ray Rast and Francis P. Bundy. [HUSL.] March 22, 1945.
- M11 Addendum to memorandum of March 9, 1945 entitled: Tests of Sangamo HP-V, No. 3 trans-

ducer. Cedric E. Hesthal and Francis P. Bundy. [HUSL.] March 26, 1945.

- M12 Tests of Sangamo HP-5, No. 5 transducer. Jack C. Cotton. [HUSL.] May 7, 1945.

612.715 Hebbphone No. 8

- M1 HP-8 laminations in the light of our HP-3 experience. Paul E. Sabine. [HUSL.] November 1, 1944.
- M2 Trip to Bell Telephone Laboratories on the question of HP-8 cable. Hugh E. Harlow. [HUSL.] January 15, 1945.
- M3 HP-8 laminated stacks. Leon W. Camp. [HUSL.] February 5, 1945.
- M4 The Bell Telephone Laboratories, Inc. 50-pair cable. Hugh E. Harlow. [HUSL.] February 7, 1945.
- M5 Cleaning and consolidation of HP-3 laminations. Leon W. Camp. [HUSL.] February 8, 1945.
- M6 Tentative schedule of measurements on 26-kc depth scanning system aboard *USS Cythera*. Robert B. Watson. [HUSL.] February 14, 1945.
- M7 Directional transmission for depth scanning. Frederick V. Hunt. [HUSL.] February 15, 1945.
- M8 Measurements of depth scanning system on *USS Cythera*. Robert B. Watson. [HUSL.] March 8, 1945.
- M9 Method for sealing Collyer 50-pair flexible, blocked cable. Alan H. Selker. [HUSL.] March 9, 1945.
- M10 Study of differences between Commutators 1 and 2 of the depth scanning system. Robert H. Hughes. [HUSL.] March 23, 1945.
- M11 Program of tests for HP-8D, No. 2 at *Barge*. Leon W. Camp, Robert B. Watson and Francis P. Bundy. [HUSL.] May 8, 1945.

612.716 SPEP Units

- M1 Tests suggested for midget asymmetrical stack. O. Hugo Schuck. [HUSL.] September 19, 1942.
- M2 Classification of stepphones. Lyman N. Miller. [HUSL.] February 3, 1943.
- M3 [The] 1-inch x 1½-inch nickel laminated stack. Leon W. Camp. [HUSL.] September 24, 1943.
- M4 Design, construction and performance of SPEP-1 transducer. Leon W. Camp and Francis P. Bundy. [HUSL.] December 8, 1943.
- M5 Calibrations and patterns of SPEP Model No. 1 [and] No. 2 [with] four quadrants in parallel. Nelson K. Moody, Jr. [HUSL.] January 24, 1944.
- M6 A study of PM polarized SPEP elements. Francis P. Bundy. [HUSL.] January 26, 1944.
- M7 Results of drop tests of SPEP-2, Nos. 1 and 2. Francis P. Bundy and Leon W. Camp. [HUSL.] February 12, 1944.
- M8 Shading for 3-inch x 6-inch SPEP transducer for General Electric. Nelson M. Blachman. [HUSL.] March 9, 1944.
- M9 Instructions for construction, testing and assembly

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- of General Electric SPEP transducers. Francis P. Bundy. [HUSL.] April 15, 1944.
- M10** Instructions for construction, testing and assembly of Harvard SPEP transducers. Francis P. Bundy. [HUSL.] April 19, 1944.
- M11** Acoustic loading tests on transducers with narrow radiating faces. Francis P. Bundy and Milton R. Carlson. [HUSL.] May 11, 1944.
- M12** SPEP beam patterns. Robert C. McLoughlin. [HUSL.] June 13, 1944.
- M13** SPEP faces. Francis P. Bundy. [HUSL.] July 10, 1944.
- M14** Density and transmission tests on nineteen SPEP discs. Jack C. Cotton. [HUSL.] July 28, 1944.
- M15** Preliminary results on high-level pulsing of a single SPEP element. Roger W. Hickman. [HUSL.] September 25, 1944.
- M16** Tests on a production unit of SPEP transducer made by the Gamewell Company. Jack C. Cotton and Paul E. Sabine. [HUSL.] September 28, 1944.
- M17** Tests on Gamewell production SPEP Units No. 3 and No. 4. Paul E. Sabine and Jack C. Cotton. [HUSL.] October 10, 1944.
- M18** Shading for additional minor lobe reduction in General Electric SPEP. Nelson M. Blachman. [HUSL.] October 25, 1944.
- M19** Some observations on the effect of current amplitude and temperature on the characteristics of a single SPEP element, MINI-SPEP. Roger W. Hickman. [HUSL.] November 29, 1944.
- M20** Test results on SPEPs 6-22, -23 [and] -24 (Gamewell -5, -6 [and] -7). Jack C. Cotton. [HUSL.] January 15, 1945.
- M21** Test results on two GE-type SPEP units made by Leeds and Northrup. Francis P. Bundy and Jack C. Cotton. [HUSL.] March 15, 1945.
- M22** Test results on SPEPs 6-25, -26 [and] -27 (Gamewell -8, -9 [and] -10). Jack C. Cotton. [HUSL.] April 9, 1945.

612.717 Sword Arm

- M1** Sword arm transducer for depth determining gear. Frederick V. Hunt. [HUSL.] December 4, 1943.
- M2** Sword depth finding hydrophone. Robert B. Watson. [HUSL.] December 18, 1943.
- M3** Design, construction and performance of the 60-kc sword arm depth angle transducer. Gerard W. Renner and Francis P. Bundy. [HUSL.] July 1, 1944.

612.8 Tube and Plate Transducers

- M1** The construction of the "tomato-can" magnetostrictive tube tester and the results obtained with it. Francis P. Bundy. [HUSL.] November 11, 1942.
- M2** Spherical WEA-1 projector. Francis P. Bundy. [HUSL.] June 17, 1943.
- M3** Transducer diaphragms. Fred H. Smith. [HUSL.] July 14, 1943.

- M4** Reduction of eddy currents in magnetostrictive tubes. Malcolm H. Hebb. HUSL. July 24, 1943.
- M5** Spherical WEA-1 projector for *Aide de Camp*. Francis P. Bundy. [HUSL.] August 14, 1943.
- M6** Optimum coil location for magnetostrictive transducers. Frederick V. Hunt. [HUSL.] September 2, 1943.
- M7** Further studies of optimum coil location for nickel tube transducers. Nelson K. Moody, Jr. [HUSL.] September 27, 1943.
- M8** [The] 4-tube hydrophone. Herbert R. Stewart. [HUSL.] October 1, 1943.
- M9** Performance variations in tube-type magnetostrictive transducers. Benjamin B. Drisko. [HUSL.] October 6, 1943.
- M10** Millerphone. John D. Lane. [HUSL.] November 2, 1943.
- M11** Tube-driven transducer design considerations. Francis P. Bundy, Harold P. Knauss and John D. Lane. [HUSL.] December 8, 1943.
- M12** Millerphone [or] casketphone. John D. Lane and Julius O. Natwick. [HUSL.] December 10, 1943.
- M13** Millerphone [No. II]. John D. Lane. [HUSL.] February 29, 1944.
- M14** Measurements on *Galaxy* QC head and associated wiring. John F. Hersh and James J. Faran, Jr. [HUSL.] April 24, 1944.
- M15** A 12-inch x 12-inch square magnetostriction transducer. (Report No. G12/R1171.) Wilbur T. Harris, Phillip B. Edwards and David W. Van Lennep. NLL. September 7, 1944.
- M16** [The] 2-V permendur hydrophones. (Report No. G12/R1168.) Wilbur T. Harris, David W. Van Lennep and Phillip B. Edwards. Service Project No. NS-102. NLL. October 6, 1944.
- M17** Funnel transducers. (Report No. G27/R1166.) Wilbur T. Harris and David W. Van Lennep. Service Project No. NS-102. NLL. October 6, 1944.
- M18** Test equipment and methods for relative permeability measurements on nickel tubing. (Report No. G12/R1230.) Robert R. MacLaughlin. Service Project No. NS-102. NLL. November 10, 1944.
- M19** Patterns of twelve-tube hydrophones. Lyman N. Miller. [HUSL.] January 15, 1945.
- M20** Twelve-tube hydrophone, No. 149 and No. 157. R. Warren Marsh. [HUSL.] January 24, 1945.

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Sonar Listening Equipment

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Listening Studies

- M1** Binaural listening system. (Report No. P12/R145.) Donald P. Loye. OEMsr-20; Section No. 6.1-sr20-565. NLL. January 12, 1943.
- M2** [Discussion at a conference on listening techniques held at New London on March 10, 1943.] Report of conference. (Report No. G1/R242.) William B. Snow. NLL. March 29, 1943.

- M3** Proposed listening tests. (Report No. G1/R407.) William B. Snow. NLL. May 22, 1943.
- M4** Listening studies using QBF and JK transducers. (Report No. G13/R599.) Donald P. Loye and A. Kenneth Tatum. Service Project No. NS-113. NLL. November 9, 1943.
- M5** Noise measurements in QBF and JK streamlined domes. (Report No. G13/R613.) A. Kenneth Tatum. NLL. November 12, 1943.
- M6** Equipment developed and used on the *Amada* for underwater sound investigations. (Report No. P33/R1379.) Walter F. Graham. NLL. February 28, 1945.
- M7** Experimental investigation of factors involved in sonic listening. (Report No. P33/R1319.) Ralph C. Maninger. OEMsr-1128; Section No. 6.1-sr1128-1932. NLL. February 28, 1945.
- M8** Fundamental listening studies at the New London Laboratory. (Report No. P33/R1409.) Ralph C. Maninger. OEMsr-1128; Section No. 6.1-sr1128-2210. NLL. May 30, 1945.
- M9** Underwater sound measuring station at Birchwood Lake. (n.a.) OEMsr-346; Section No. 6.1-sr346-1332. BTL. July 27, 1945.

622 Surface Vessels

622.1 Experimental Systems

- M1** The use of the CK tube as an antisubmarine listening device. Irving Langmuir and E. F. Hennelly. GE. February 15, 1943.
- M2** Phase-actuated locator. (n.a.) OEMsr-695; OSRD No. 1897; Section No. 6.1-sr695-997. BTL. August 30, 1943.
- M3** Comparative field tests of underwater listening equipment installed on the *Elcobel*. (Report No. P33/R862.) Walter F. Graham and Ralph C. Maninger. OEMsr-1128; Section No. 6.1-sr1128-1569. NLL. September 30, 1944.
- M4** Electrical equipment for patrol craft listening systems. (n.a.) OEMsr-346; OSRD No. 4846; Section No. 6.1-sr346-1322. BTL. December 1, 1944.
- M5** Listening systems for patrol craft. (n.a.) OEMsr-692; Section No. 6.1-sr692-1698. BTL. December 1, 1944.

622.2 JP Overside System

- M1** Directive overside listening gear for small patrol craft. Plans for production of trial lot. (Report No. D22/3268.) J. Warren Horton. Service Project No. NS-113. NLL. June 16, 1942.
- M2** Maintenance manual for JP sonic listening equipment, Mark II. (Report No. D22/3783.) (n.a.) NLL. September 1, 1942.
- M3** Deep and shallow water tests on D22-JP listening equipment. (n.a.) [OEMsr-20 and OEMsr-30.] NLL and UCDWR. November 3, 1942.
- M4** The JP overside directive sonic listening equipment for small patrol craft. (Report No. D22.2/

3975.) Russell O. Hanson. OEMsr-20; Service Project No. NS-113; Section No. C4-sr20-541. NLL. November 6, 1942.

- M5** The JP overside and through-the-hull directive sonic listening equipment for small patrol craft. (Report No. D22/D38/R1310.) Russell O. Hanson and Edwin E. Teal. OEMsr-1128; Service Project No. NS-113; OSRD No. 4744; Section No. 6.1-sr1128-1928. NLL. February 7, 1945.

622.3 Through-the-Hull System

- M1** Through-the-hull sonic listening equipment. (Report No. D38/R155.) Edwin E. Teal. NLL. April 22, 1943.
- M2** Deep water tests of the through-the-hull sonic listening equipment. (Report No. U-73.) T. F. Johnston. OEMsr-30. UCDWR. June 18, 1943.
- M3** Comparative listening tests of through-the-hull sonic and supersonic and QBG sonic and supersonic listening equipment. (Report No. D38/R374.) Ralph C. Maninger and A. Kenneth Tatum. OEMsr-20; Service Project No. NS-113; OSRD No. 1593; Section No. 6.1-sr20-790. NLL. June 23, 1943.

623 Submarines

- M1** Sonic detection of an airplane from a submarine. L. J. Sivian. UCDWR. December 26, 1941.
- M2** Observations and operations of ship's noise aboard the *USS Balao*, April 27, 1943. (Report No. D24/R314.) R. York Chapman. NLL. May 5, 1943.
- M3** Sonic listening and recordings of sounds from the *USS Balao* during deep submergence tests, April 27, 1943. (Report No. G1/R333.) Edwin E. Teal. NLL. May 12, 1943.
- M4** Submarine and surface craft listening equipment. (Report No. D24/D38/R391.) Donald P. Loye and Ralph C. Maninger. OEMsr-20; Service Project No. NS-113; Section No. 6.1-sr20-1020. NLL. September 10, 1943.
- M5** Conference on submarine sound equipment. (Report No. P32/R608.) William B. Snow. NLL. November 8, 1943.
- M6** Detection of aircraft by listening from submarines. (Report No. P33/R1437.) Ralph C. Maninger and Edward Gerjuoy. OEMsr-1128; Section No. 6.1-sr1128-2221. NLL. May 31, 1945.

623.1 JP-1 Topside System

- M1** Installation, operation and maintenance of JP-1 sound receiving equipment. Topside sonic listening equipment. (Report No. D24/R417.) (n.a.) Service Project No. NS-113. NLL. September 1, 1943.
- M2** Transmission of noise through JP-1 training gear. (Report No. D24/R550.) Hollie C. Williams. Service Project No. NS-113. NLL. October 14, 1943.
- M3** Submarine listening systems. Report of confer-

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ence, September 29, 1943. (Report No. D24/P30/R560.) Carlton R. Sawyer. NLL. October 26, 1943.

- M4** The Model JP-1 sound-receiving equipment. (Report No. D24/R540.) Hollie C. Williams. OEMsr-20 and OEMsr-1128; Service Project NS-113; Section No. 6.1-sr1128-1033. NLL. March 16, 1944.
- M5** Tests of JP-1 equipment with 3-ft, 4-ft and 5-ft hydrophones and QB sound gear. (Report No. P33/R1031.) Walter F. Graham. NLL. July 13, 1944.
- M6** Permoflux headset for JP series equipment. (Report No. D24/R1128.) William B. Snow. Service Project No. NS-113. NLL. September 14, 1944.
- M7** Model tests of JP-1, 5-foot hydrophone baffle. (Report No. G2/6116.) Leslie J. Hooper. NLL. January, 1945.
- M8** Sonic listening aboard submarines. (n.a.) OEMsr-1131; Service Project No. NS-140; OSRD No. 5311; Section No. 6.1-sr1131-1885. Sonar Analysis Section. February, 1945.
- M9** Basic factors affecting the performance of sonic listening gear on submarines. (n.a.) OEMsr-1131; Service Project No. NS-140; OSRD No. 5031; Section No. 6.1-sr1131-1888. Sonar Analysis Section. February, 1945.
- M10** Maintenance and trouble-shooting instructions for Models JP-1, JP-2 and JP-3 sound-receiving equipment. (Report No. D24/R837.) (n.a.) OEMsr-1128; Service Project No. NS-113. NLL. (n.d.)
- M11** Some investigations of isolation mounts for JP-1 sound-receiving equipment. (Report No. D24/R750.) Mark Harrison. Service Project No. NS-113. NLL. (n.d.)

623.2 JT System

- M1** Preliminary operating instructions for the JT sonar equipment. (Report No. D55/R1229-A.) (n.a.) OEMsr-1128; Service Project Nos. NS-113 and NS-337. NLL. December, 1943.
- M2** Modification of submarine sonar equipment. Plan II, Right-left indicator applied to QB projector with JP-1 listening gear installed in conning tower. (Report No. D55/R825.) William F. Arndt and Ogden E. Sawyer. Service Project Nos. NS-113 and NS-142. NLL. March 23, 1944.
- M3** Modification of submarine sonar equipment. Plan I, Right-left indicator and power training for JP-1 gear. (Report No. D55/R826.) William F. Arndt and Ogden E. Sawyer. Service Project Nos. NS-113 and NS-142. NLL. March 24, 1944.
- M4** Modification of submarine sonar equipment. Plan III, Right-left indicator applied to QB projector with JP-1 and QC-JK operator in forward torpedo room. (Report No. D55/R824.) William F. Arndt and Ogden E. Sawyer. Service Project Nos. NS-113 and NS-142. NLL. March 24, 1944.
- M5** Difference listening as an aid to the right-left indicator in the D-55 system. (Report No. D55/

R1187.) Robert J. Callen. Service Project Nos. NS-113 and NS-330. NLL. October 17, 1944.

- M6** Operator's manual for the Model JT sonar equipment. (Report No. D55/R1401.) (n.a.) NLL. February 28, 1945.
- M7** The Model JT sonar equipment. (Report No. D55/R1069.) Carlton R. Sawyer. OEMsr-1128; Service Project No. NS-337; OSRD No. 5275; Section No. 6.1-sr1128-2215. NLL. May 25, 1945.

623.3 Triangulation-Listening-Ranging System

- M1** Preliminary investigation for a proposed dual listening system, from August 9 to September 9, 1943. (Report No. P30/R519.) Charles J. Loda and J. Kneeland Nunan. NLL. September 13, 1943.
- M2** Analyses of bearing deviation indicator (BDI) systems. (Report No. D51/R823.) William F. Arndt. NLL. March 10, 1944.
- M3** Discussion of balance requirements of hydrophones used with a right-left indicator type of bearing deviation indicator. (Report No. D51/D55/R845.) William F. Arndt. NLL. March 22, 1944.
- M4** Interference and its effects on the right-left indicator indication. (Report No. D51/D55/R1405.) Frederick C. Reed, Jr. Service Project Nos. NS-247 and NS-337. NLL. February 28, 1945.
- M5** Mechanical features of JAA training system. (Report No. D51/R1407.) Calvin A. Gongwer. Service Project No. NS-247. NLL. February 28, 1945.
- M6** Discussion of electronic equipment for triangulation-listening-ranging system on *USS Conger*. (Report No. D51/R1422.) Leonard W. Nosker and Richard G. Stephenson. Service Project No. NS-247. NLL. February 28, 1945.
- M7** Submarine triangulation-listening-ranging system. (Report No. D51/R1429.) Carlton R. Sawyer. OEMsr-1128; Service Project No. NS-247; OSRD No. 5291; Section No. 6.1-sr1128-2218. NLL. May 28, 1945.
- M8** Instruction guide for Sperry equipment used in the triangulation-listening-ranging system. (n.a.) Sperry Gyroscope Company, Inc. (n.d.)

623.4 Communications

623.41 Internal

- M1** Tests on 1-mc and 7-mc intercommunication systems of the *USS Perch*. (Report No. P42/R759.) Ralph C. Maninger and Wilbur T. Knudsen. NLL. February 17, 1944.
- M2** Comparison of 7-mc and 44-mc internal communication systems. (Report No. D54/R933.) Donald A. Proudfoot and Edwin E. Teal. Service Project No. NS-212. NLL. May 20, 1944.
- M3** Submarine internal communication systems, 1-mc to 7-mc. Summary of studies, recommendations for improvements and descriptions of modified system on *USS Becuna* (SS319). (Report No. D54/

R992.) Donald A. Proudfoot and Edwin E. Teal.
Service Project No. NS-212. NLL. June 28, 1944.

623.42 Underwater Telephony

- M1** Supersonic underwater telephony. (Report No. P29/R715.) Victor V. Graf and Ray S. Alleman. OEMsr-1128; Service Project No. NS-248; Section No. 6.1-sr1128-1560. NLL. March 30, 1944.
- M2** Underwater telephony by means of frequency modulation. R. W. Beckwith. OEMsr-323; Service Project No. NS-248. GE. October 6, 1944.
- M3** Sea trials of underwater telephony system. (Report No. D56/PHR75.) William F. Arndt. CUDWR. January 20, 1945.
- M4** An 8.2-kc single side-band underwater telephony system. (Report No. D56/R1395.) Frank P. Herrnfeld. Service Project No. NS-248. NLL. February 28, 1945.
- M5** Underwater telephony. (Report No. D56/R1415.) J. Warren Horton. OEMsr-1128; Service Project No. NS-248; OSRD No. 5183; Section No. 6.1-sr1128-2211. NLL. May 15, 1945.

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624.1 Expendable Radio Sonic Buoy (ERSB)

- M1** The expendable radio sono buoy. (Report No. D16/R1035.) (n.a.) OEMsr-1128; Service Project Nos. NS-106 and NS-198; OSRD No. 4115; Section No. 6.1-sr1128-1581. NLL. July 27, 1944.

624.11 Equipment

- M1** Headphones for expendable radio sonic buoy operators. (Report No. D16/R152.) William B. Snow. OEMsr-20; Section No. 6.1-sr20-633. NLL. January 21, 1943.
- M2** Desirable characteristics for expendable radio sonic buoy system. (Report No. D16/R156.) William D. Neff. NLL. January 28, 1943.
- M3** Operation and use of the expendable radio sonic buoy equipment. (Report No. D16/R188.) (n.a.) OEMsr-20; Section No. 6.1-sr20-657. NLL. April 13, 1943.
- M4** Necessary AN/CRT-1 electrical improvements. Expendable radio sonic buoy. (Report No. D16/R381.) Henry N. Jasper, Jr. and Walter L. Clearwaters. Service Project No. NS-106. NLL. June 12, 1943.
- M5** Maintenance instructions for radio transmitting equipment, AN/CRT-1A. (Report No. D16/R912.) (n.a.) Service Project No. NS-106. NLL. May 12, 1944.

624.12 Performance Tests

- M1** Expendable radio sonic buoy and magnetic airborne detection submarine search tests, April 23, 1943, Lakehurst, New Jersey. (Report No. D16/R320.) Russell I. Mason. NLL. May 5, 1943.
- M2** Comparative listening tests. (Report No. D16/R362.) William D. Neff. NLL. May 28, 1943.

- M3** Expendable radio sonic buoy pattern operation with single frequency and multiple frequency methods. AN/CRT-1 and AN/ARR-3 equipments. (Report No. D34/R378.) Joseph A. Barkson. Service Project No. NS-106. NLL. June 4, 1943.
- M4** Expendable radio sono buoy and magnetic airborne detection submarine search tests. (Report No. D16/R438.) Russell V. Lewis. Service Project No. NS-106. NLL. July 23, 1943.
- M5** Headphone comparison tests. (Report No. G27/R952.) Merritt B. Jones and William B. Snow. NLL. June 1, 1944.
- M6** Representative performance characteristics [of] Mark IV-E expendable radio sono buoy hydrophones. (Report No. D16/R685.) Joseph A. Barkson and Ralph R. MacLaughlin. Service Project No. NS-106. NLL. August 9, 1944.
- M7** Expendable radio sono buoy. Use with echanging equipment. (Report No. D16/R1368.) Price E. Fish. NLL. February 20, 1945.

624.2 Directional Radio Sonic Buoy (DRSB)

- M1** Method of adding directional characteristics to the radio sonic buoy. (Report No. D34/R281.) Russell I. Mason. NLL. May 3, 1943.
- M2** Binaural non-rotating directional radio sonic buoy system. Elliott J. Lawton. OEMsr-323; OSRD No. 1878; Section No. 6.1-sr323-1108. GE. August 16, 1943.
- M3** Directional radio sono buoy conference and demonstration, ASDevLant, Quonset, Naval Air Station, March 22, 1944. (Report No. D34/R747.) Joseph A. Barkson. Service Project No. NS-106. NLL. March 29, 1944.
- M4** Installation and maintenance instructions for radio receiving equipment, AN/ARR-16. (Report No. D34/R1167.) (n.a.) Service Project No. NS-106. NLL. November 1, 1944.
- M5** Maintenance instructions for radio transmitting equipment, AN/CRT-4(XN-1). (Report No. D34/R1169.) (n.a.) Service Project No. NS-106. NLL. November 15, 1944.
- M6** Operator's manual for the directional radio sono buoy. (Report No. D34/R1260.) (n.a.) Service Project No. NS-330. NLL. December 15, 1944.
- M7** The directional radio sono buoy. (Report No. D34/R1200.) (n.a.) OEMsr-1128; Service Project Nos. NS-106 and NS-198; OSRD No. 5279; Section No. 6.1-sr1128-224. NLL. May 20, 1945.

624.21 Performance Tests

- M1** Listening tests on May 14, 1943, of hydrophone for directional sonic buoy. (Report No. D34/R349.) Ralph C. Maninger. Service Project No. AC-55. NLL. May 19, 1943.
- M2** Conference on D-34 listening tests. (Report No. D34/R372.) Ralph C. Maninger. NLL. June 2, 1943.

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624.3 Blimp-Towed Hydrophone Systems

- M1** Towed hydrophone for blimp use. (Report No. P2/2767.) Russell I. Mason. NLL. May 9, 1942.
- M2** The use of hydrophones towed from dirigibles. (Report No. D25.2/4178.) J. Warren Horton. NLL. October 7, 1942.
- M3** Blimp-towed hydrophones. (Report No. D25/4423.) William H. Fritz. Service Project No. NA-107. NLL. May 7, 1943.
- M4** [The] HW-towed hydrophone. (n.a.) OEMsr-1046; Service Project No. NA-107 and MIT Research Project DIC-6187; Section No. 6.1-sr1046-1679. MIT. December 1, 1944.
- M5** Blimp-towed hydrophone. (Report No. D25/R1240.) William H. Fritz. OEMsr-20; Service Project No. NA-107; OSRD No. 4450; Section No. 6.1-sr20-1920. NLL. December 1, 1944.
- M6** Towed microphones for blimps. (Report No. D25/3395.) William H. Fritz. NLL. (n.d.)
- M7** Depth of towed fish and the general curve of a towing cable in water or air. (Report No. G2/R238.) Calvin A. Gongwer. OEMsr-20; Service Project No. NA-107; Section No. 6.1-sr20-659. NLL. (n.d.)
- M8** Towed hydrophones for high speeds as used at [the] New London Laboratory. (Report No. D25/3864.) Dick P. Fullerton, Jr. NLL. (n.d.)

625 Harbor Protection

- M1** Snap diaphragm. Apparent mode of operation. Harry Nyquist. Section No. 6.1-NDRC-1481. Division 6. August 18, 1944.

625.1 Cable-Connected Hydrophone System

- M1** Chesapeake Bay Project. Cable-connected hydrophones. (Report No. D12B/3193.) J. Warren Horton and Michael S. Shane. NLL. May 16, 1942.
- M2** Cable-connected hydrophones. Block Island installation. (Report No. D12A/3013.) J. Warren Horton and Michael S. Shane. NLL. June 2, 1942.
- M3** Chesapeake Bay cable-connected hydrophone system. (Report No. D12B/R115.) Robert A. Wagner. OEMsr-20; OSRD No. 1181; Section No. 6.1-sr20-566. NLL. January 11, 1943.
- M4** Program repeater for Chesapeake Bay cable installation. (Report No. D12B/R195.) Frank P. Herrnfeld. NLL. March 19, 1943.
- M5** Comparative tests on Block Island amplifier system vs amplifier tentatively selected for the Chesapeake Bay cable-connected hydrophone installation. (Report No. D12AB/3898.) Donald P. Loye, Henry B. Hoff and Mark Harrison. NLL. September 12, 1942.
- M6** Loss reduction obtainable by loading 107-type submarine signal cable. (Report No. 3430-TS-HHF-VB.) T. Shaw. BTL. January 12, 1943.
- M7** Cape Henry listening post. Report of transmission

tests on line facilities. (Report No. 3430-HHF-EN.) H. H. Felder. BTL. January 12, 1943.

- M8** Noise on hydrophone cable at Cape Henry, Virginia. (Report No. 3410-RST-HP.) R. S. Tucker. BTL. February 5, 1943.
- M9** Cable-connected hydrophone systems. (Report No. D12/R1213.) William B. Snow, Henry B. Hoff and Alice M. Berry. OEMsr-1128; Service Project No. NO-163; OSRD No. 5243; Section No. 6.1-sr1128-1946. NLL. May 21, 1945.

625.11 Harbor Noise Surveys

- M1** Investigation of water noise conditions in Chesapeake Bay, May 18 to June 3, 1942. (Report No. D12B/3289.) Donald P. Loye and Donald A. Proudfoot. OEMsr-20; Section No. C4-sr20-221. NLL. July 15, 1942.
- M2** Supplementary investigation of water noise in Chesapeake Bay, July 6 to 10, 1942. Donald P. Loye, Donald A. Proudfoot and Sylvester J. Haefner. OEMsr-20; OSRD No. 828; Section No. C4-sr20-235. NLL. August 24, 1942.
- M3** Underwater sound survey of New York harbor approaches. (Report No. D12E/R453.) Donald A. Proudfoot. OEMsr-20; Service Project No. NO-163; Section No. 6.1-sr20-794. NLL. August 28, 1943.

625.2 Anchored Radio Sonic Buoy (ARSB)

- M1** Tests of subaqueous microphones for sono radio buoys. (Report No. D3/1908.) J. Warren Horton and William B. Snow. OEMsr-20; Section No. C4-sr20-055. NLL. January 27, 1942.
- M2** Pre-emphasis in sono radio buoys. (Report No. D3/2601.) William B. Snow. NLL. April 22, 1942.
- M3** Hydrophone listening tests. (Report No. G12/2623.) Donald P. Loye and Russell O. Hanson. OEMsr-20; Section No. C4-sr20-090. NLL. April 30, 1942.
- M4** Field test of new type sono radio buoy transmitter in Boston Harbor area, May 20 to 27 [1942] inclusive. (Report No. D3/2978.) Robert A. Fox. NLL. June 1, 1942.
- M5** Water noise tests on Block Island on the JM-1 radio sonic buoy. (Report No. D3.2/3977.) Robert A. Fox. NLL. September 15, 1942.
- M6** The anchored radio sono buoy. (Report No. D3/R1311.) William B. Snow, Russell I. Mason and Walter F. Graham. OEMsr-1128; Service Project No. NS-102; OSRD No. 4745; Section No. 6.1-sr1128-1929. NLL. February 10, 1945.

626 Antitorpedo**626.1 Merchant Vessel Systems**

- M1** Calibration tests of Electro Protective Corporation's torpedo detector installed on tanker *Mobilgas*. (Report No. P20/R517.) Edwin E. Teal,

Sylvester J. Haefner and Edward Gerjuoy. NLL. October 13, 1943.

- M2** Merchant vessel protection. Sonic detection of torpedoes from merchant ships. (Report No. P20/R688.) William B. Snow and Donald A. Proudfoot. OEMsr-1128; OSRD No. 3265; Section No. 6.1-sr1128-1253. NLL. [February 3, 1944.]
- M3** Status of merchant vessel protection listening equipment on *USS YP252*. (Report No. P20/R977.) Edwin E. Teal and William B. Snow. NLL. July 11, 1944.
- M4** Additional torpedo noise measurements. (Report No. P20/R1022.) Edwin E. Teal. NLL. July 12, 1944.
- M5** Tests on the Electro Protective Corporation torpedo detector. (Report No. P20/R1050.) William B. Snow and Edwin E. Teal. OEMsr-1128; Section No. 6.1-sr1128-1582. NLL. November 15, 1944.
- M6** Merchant vessel protection. An evaluation of means of providing protection for merchant vessels against torpedo attack. (Report No. P20/R1216.) William B. Snow, Donald A. Proudfoot and Edwin E. Teal. OEMsr-1128; Section No. 6.1-sr1128-1597. NLL. November 30, 1944.

626.2 Submarine Installations (WCA-2)

- M1** Installation, operation and maintenance instructions for the torpedo-detection modification of the WCA-2 sonar equipment. (Report No. P60/R1316.) (n.a.) OEMsr-1128. NLL. February 15, 1945.
- M2** Self-noise measurements with QB transducer with and without streamlined dome [on the] *USS Thornback*. (Report No. P60/R1346.) Henry B. Hoff and F. T. Schell. NLL. February 28, 1945.
- M3** Load tests on WCA-2 training equipment while operated at torpedo-detection scanning speeds with and with 57-inch Budd dome [on the] *USS Thornback*. (Report No. P60/R1431.) F. T. Schell. NLL. February 28, 1945.
- M4** The WCA-2 torpedo-detection modification. (Report No. P60/R1427.) J. Warren Horton, Victor V. Graf and F. T. Schell. OEMsr-1128; Service Project No. NS-113; OSRD No. 5274; Section No. 6.1-sr1128-2216. NLL. May 28, 1945.

630 Echo-Ranging Systems

631 QC Improvements

- M1** Description of devices to be demonstrated on *USS Semmes* and *USS Galaxy*. (n.a.) OEMsr-287; Section No. 6.1-sr287-776. HUSL. May 22, 1943.
- M2** Instruction book for echo-ranging conversion unit. (n.a.) HUSL. August 10, 1943.
- M3** Submarine detection. Use of rounded pings. Harry Nyquist. Section No. 6.1-NDRC-1480. Division 6. March 31, 1944.
- M4** Echo ranging from submarines. Range indicator requirements. (Report No. P29/R1076.) J. Warren Horton. Service Project No. NS-142. NLL. August 16, 1944.

631.1 Gain Compensating Circuits

631.11 Time-Variied Gain (TVG)

- M1** Time variation of gain for standard QC receivers. J. Lewis Hathaway. OEMsr-287; Section No. C4-sr287-178. HUSL. July 26, 1942.
- M2** QBE receiver modifications. J. Lewis Hathaway, Charles R. Rutherford and William A. Felsing. OEMsr-287; Section No. 6.1-sr287-766. HUSL. April 26, 1943.
- M3** Time-varied gain for sonar equipment. (n.a.) OEMsr-287; OSRD No. 5340; Section No. 6.1-sr287-2076. HUSL. June 15, 1945.

631.12 Reverberation-Controlled Gain (RCG)

- M1** Reverberation-controlled gain for bearing deviation indicator. A. Wilson Nolle. [HUSL.] October 11, 1943.
- M2** Reverberation-controlled gain. J. Lewis Hathaway. [HUSL.] November 15, 1943.
- M3** State of development of Model X-2-A echo-ranging booster. Paul B. Sebring. [HUSL.] April 17, 1944.
- M4** Additional questions which have been brought up by our experiences off San Diego with Model X-2-A echo-ranging booster. Paul B. Sebring. [HUSL.] June 1, 1944.
- M5** Reverberation-controlled gain for sonar equipment. (n.a.) OEMsr-287; OSRD No. 5415; Section No. 6.1-sr287-2079. HUSL. July 15, 1945.

631.13 Automatic Gain Control (AGC)

- M1** Automatic gain control in echo-ranging systems. Frederick V. Hunt. OEMsr-287; Section No. 6.1-sr287-764. HUSL. April 13, 1943.
- M2** Development of automatic volume control for the D-20 rack. (Report No. D20/R313.) Richard G. Stephenson. NLL. April 30, 1943.
- M3** Two methods of gain control in Asdic receivers. (Internal Report No. 180.) R. Hall and H. M. McNair. OSRD Liaison Office No. WA-2389-9. HMA/SEE, Fairlie Laboratory [Great Britain]. June 2, 1944.

631.2 Projector Training Controls

631.21 Automatic Target Training (ATT)

- M1** Factors involved in proportional control automatic training. A. Wilson Nolle. [HUSL.] October 17, 1942.
- M2** Summary of the work in Key West during recent trip. Isaac P. Rodman. [HUSL.] March 17, 1943.
- M3** Echo-ranging booster and automatic target training installation and tests on *Sylph*. Carl M. Herget. [HUSL.] September 1, 1943.
- M4** Dynamic character of the automatic target training gate. (Part II.) Fred H. Smith. [HUSL.] September 13, 1943.
- M5** Automatic gain control for automatic target train-

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- ing. A. Wilson Nolle. [HUSL.] September 14, 1943.
- M6** Another method of reducing hunting of automatic target training. Paul B. Sebring. [HUSL.] September 17, 1943.
- M7** Automatic target training pipping circuit. Charles R. Rutherford, Marvin J. Foral and C. Samuel Lombardi. [HUSL.] December 27, 1943.
- M8** San Diego trip. Isaac P. Rodman. [HUSL.] January 12, 1944.
- M9** Conversion unit installations in San Diego and Key West. Paul B. Sebring. [HUSL.] March 2, 1944.
- M10** Proportional automatic target training. Norman B. Saunders. [HUSL.] March 16, 1944.
- M11** Triangulation-listening-ranging system. (Report No. D51/R767.) William F. Arndt. OEMsr-1128; Service Project No. NS-247; Section No. 6.1-sr1128-1570. NLL. April 29, 1944.
- M12** Super flat automatic volume control amplifier. John E. DeTurk. [HUSL.] July 5, 1944.
- M13** Key West trip. Automatic target training check and installation of relayless echo-ranging booster. Allen A. Chernosky. [HUSL.] August 10, 1944.
- M14** Automatic target training. (n.a.) OEMsr-287; Section No. 6.1-sr287-2067. HUSL. August 15, 1945.
- 631.22 Maintenance of True Bearing (MTB)**
- M1** Immediate application of true bearing training to amplidyne-equipped QC echo-ranging gear. (Report No. D20/R103.) Glenn D. Gillett. OEMsr-20; Section No. C4-sr20-544. NLL. December 4, 1942.
- M2** Installation of maintenance of true bearing on *USS PC-451*. (Report No. D40/R551.) Wayne G. Shaffer. NLL. October 14, 1943.
- M3** Maintenance of true bearing projector training. (Report No. D40/R760.) Glenn D. Gillett and Ogden E. Sawyer. OEMsr-1128; Service Project No. NS-142; Section No. 6.1-sr1128-1561. NLL. March 31, 1944.
- 631.23 Electronic Automatic Search (EAS)**
- M1** Harvard stack. Head training arrangements with relays. Hugh E. Harlow. [HUSL.] August 30, 1943.
- M2** QC sonar console training system. Fred H. Smith. [HUSL.] January 8, 1944.
- M3** Electronic automatic search. (n.a.) OEMsr-287; Section No. 6.1-sr287-2052. HUSL. December 1, 1944.
- 631.3 Doppler Applications**
- M1** Signal distortion in the doppler multiplier. A. Wilson Nolle. [HUSL.] October 26, 1942.
- M2** Diode-type electronic switch for use as a doppler gate. Nick A. Abourezk. [HUSL.] November 24, 1943.
- M3** A disquisition concerning false dopplers. Harvey A. Brooks. [HUSL.] August 16, 1944.
- M4** Doppler sensitive range marking. Robert E. Kirkland. [HUSL.] January 25, 1945.
- M5** Sonar doppler applications. (n.a.) OEMsr-287; OSRD No. 6558; Section No. 6.1-sr287-2069. HUSL. November 15, 1945.
- 631.31 Own-Doppler Nullifier (ODN)**
- M1** Own-doppler nullifier. Isaac P. Rodman. [HUSL.] November 10, 1942.
- M2** Automatic frequency control, referring to own-doppler nullifier. A. Wilson Nolle. [HUSL.] January 11, 1943.
- M3** Frequency modulation of a phase shift oscillator for use to nullify doppler due to ship speed. Roland K. Blumberg. [HUSL.] January 13, 1943.
- M4** Present performance of the own-doppler nullifier on *USS Ordronaux* (DD-617). A. Wilson Nolle. [HUSL.] March 4, 1943.
- M5** Electronic own-doppler nullifier. A. Wilson Nolle and William A. Felsing. OEMsr-287; Section No. 6.1-sr287-719. HUSL. March 24, 1943.
- M6** Relay elimination. Paul B. Sebring. [HUSL.] November 16, 1943.
- M7** Reactance tube frequency control. (n.a.) OEMsr-287; Section No. 6.1-sr287-1344. HUSL. January 5, 1944.
- M8** Relay delay circuit for echo-ranging booster, Models I and II, or whatever these model numbers shall finally turn out to be. Paul B. Sebring. [HUSL.] January 18, 1944.
- M9** Own-doppler nullifier, computed vs reverberation. (Corrected.) O. Hugo Schuck. [HUSL.] January 21, 1944.
- M10** Regular echo-ranging booster discriminator, or on-off discriminator as a continuous own-doppler nullifier. Allen A. Chernosky. [HUSL.] March 23, 1944.
- M11** Double-ended discriminator output and two-channel voltage booster for use with own-doppler nullifier. Allen A. Chernosky. [HUSL.] March 23, 1944.
- M12** Present status of the doppler gain control system for bearing deviation indicator. Paul B. Sebring. [HUSL.] July 25, 1944.
- M13** Own-doppler nullifier and doppler-sensitive bearing deviation indicator attachment for Submarine Signal Company equipment. Charles P. Boner. [HUSL.] October 17, 1944.
- M14** Overall picture regarding dopplerization of Radio Corporation of America's QGB gear. Paul B. Sebring. [HUSL.] October 20, 1944.
- M15** Own-doppler nullifier on Sangamo sonar. Isaac P. Rodman. [HUSL.] December 5, 1944.
- M16** Multisection filters for own-doppler nullifier. Frederick V. Hunt. [HUSL.] January 4, 1945.
- M17** Recent exchange with F. V. Hunt on own-doppler nullifier filters. Paul B. Sebring. [HUSL.] January 12, 1945.

- 631.32 Reverberation Suppression Filter (RSF)**
M1 *Galaxy* tests on own-doppler nullifier and reverberation suppression filter performance. Paul B. Sebring. [HUSL.] March 9, 1944.
M2 *Galaxy* tests on own-doppler nullifier and reverberation suppression filter performance. Paul B. Sebring. [HUSL.] March 14, 1944.
M3 Time delay in filter networks. Frederick V. Hunt. [HUSL.] December 5, 1944.
- 631.33 Electronic Aural Responder (EAR)**
M1 Equivalent aural response system. Leon G. S. Wood, Robert E. Kirkland and Norman B. Saunders. [HUSL.] April 4, 1945.
- 631.34 Target Doppler Indicator (TDI) and Echo Doppler Indicator (EDI)**
M1 General possibilities for visual doppler indication. A. Wilson Nolle. [HUSL.] August 12, 1942.
M2 Anomalous doppler effect. A. Wilson Nolle. [HUSL.] October 23, 1942.
M3 Target doppler indicator, enhancer and own-doppler nullifier. Paul B. Sebring. [HUSL.] February 25, 1943.
M4 Echo doppler indicator. (Report No. D26/R504.) J. Warren Horton. OEMsr-20; Section No. 6.1-sr20-1023. NLL. September 10, 1943.
M5 Echo doppler indicator. (Report No. P36/R1262.) J. Warren Horton. OEMsr-1128; Service Project No. NS-142; Section No. 6.1-sr1128-1924. NLL. December 15, 1944.
- 631.35 Audible Doppler Enhancer (ADE)**
M1 The audible doppler enhancer. A. Wilson Nolle. OEMsr-287; Section No. C4-sr287-488. HUSL. August 28, 1942.
M2 Enhancement of doppler effect. A. Nelson Butz, Jr. [HUSL.] September 5, 1942.
M3 Addition and subtraction method for doppler enhancement. A. Wilson Nolle. [HUSL.] November 7, 1942.
M4 Cross modulation in 3:1 and 4:1 frequency modulation. A. Wilson Nolle. [HUSL.] November 9, 1942.
M5 Doppler doubler and square-law amplifier. (Report No. U-67.) William A. Myers and Vaughn G. McKenney. OEMsr-30; Service Project No. NS-142; Section No. 6.1-sr30-912. UCDWR. May 20, 1943.
M6 What about doppler doublers? A. Wilson Nolle. [HUSL.] September 7, 1943.
M7 Demonstration of [the] audible doppler enhancer by Myers at SCTC, Miami. Carl M. Herget. [HUSL.] October 16, 1943.
M8 Doppler doublers and square-law amplifiers for scanning sonar. Frederick V. Hunt. [HUSL.] January 5, 1945.
- 631.4 Bearing Deviation Indicator (BDI)**
M1 Bearing deviation indicator. (n.a.) OEMsr-287; OSRD No. 6425; Section No. 6.1-sr287-2075. HUSL. November 1, 1945.
- 631.41 Theory**
M1 Simultaneous lobe comparison development. J. Lewis Hathaway and O. Hugo Schuck. OEMsr-287; Section No. 6.1-sr287-384. HUSL. January 1, 1943.
M2 Split beam direction finding. (Internal Report No. 77.) (n.a.) OSRD Liaison Office No. WA-107-11. HMA/SEE, Fairlie Laboratory [Great Britain]. April 22, 1942.
M3 Mathematical discussion of proposed bearing deviation indicator circuits. ([Technical Memorandum No. MM-43-3510-HCF-HP.] H. C. Fleming. BTL. April 16, 1943.
M4 Proposal for oscillating beam receiver for echo ranging. Frederick V. Hunt. [HUSL.] June 2, 1943.
M5 Computations on bearing deviation indicator response. (Report No. D51/R765.) Edward Gerjuoy and Edward S. Seeley. Service Project Nos. NS-113 and NS-247. NLL. February 21, 1944.
M6 Bearing deviation indicator operation. (n.a.) OEMsr-287; Section No. 6.1-sr287-1450. HUSL. March 27, 1944.
M7 Comparisons of bearing deviation indicator systems. Malcolm H. Hebb, Gerald I. Harrison and Nelson M. Blachman. OEMsr-287; Section No. 6.1-sr287-1549. HUSL. May 20, 1944.
M8 Theoretical formulae for some bearing deviation indicator systems. (Report No. D51/R974.) Edward Gerjuoy. Service Project Nos. NS-247 and NS-113. NLL. August 9, 1944.
- 631.411 Harvard Underwater Sound Laboratory Systems (SLC)**
M1 Harvard-NDRC Underwater Sound Project. Prospectus and outline. (n.a.) HUSL. August 15, 1941.
M2 True reference training. Observations of *PC-551*. O. Hugo Schuck. [HUSL.] [June, 1942.]
M3 SLC, simultaneous lobe comparison. Isaac P. Rodman. [HUSL.] February 8, 1943.
M4 Change in simultaneous lobe comparison nomenclature. Frederick V. Hunt. [HUSL.] May 1, 1943.
M5 Reactions to plan position indicator tests aboard *USS Galaxy*. Henry M. Lane. [HUSL.] May 8, 1943.
M6 Cogitations on: Plan position indicator and bearing deviation indicator, formerly known as plan position indicator and simultaneous lobe comparison. Presented for comment. O. Hugo Schuck. [HUSL.] June 2, 1943.
M7 Simultaneous lobe comparison response curves. (Part II.) Claude W. Horton. [HUSL.] November 4, 1943.
M8 Bearing deviation indicator sample traces. (n.a.) OEMsr-287; OSRD No. 3402; Section No. 6.1-sr287-1441. [HUSL.] February 21, 1944.

- M9 Comparison of bearing deviation indicator, Models X-3 and X-4, in response to noise. Malcolm H. Hebb and Gerald I. Harrison. [HUSL.] April 5, 1944.

631.412 Radio Corporation of America Systems

- M1 Simplified simultaneous lobe comparison proposed by L. Barton of Radio Corporation of America. O. Hugo Schuck. [HUSL.] March 25, 1943.
- M2 Identity of Barton's proposed system with simultaneous lobe comparison. Harvey A. Brooks. [HUSL.] March 30, 1943.
- M3 Errors due to phase shift in Barton's simultaneous lobe comparison system. Harvey A. Brooks. [HUSL.] March 30, 1943.
- M4 Trip to New London to observe Barton's apparatus on SC-665. Robert B. Bowersox and O. Hugo Schuck. [HUSL.] August 18, 1943.

631.42 Circuits

- M1 Indicating systems for SLCA device. A. Wilson Nolle. [HUSL.] January 12, 1942.
- M2 Simultaneous lobe comparison direct-connected lag line development. O. Hugo Schuck. [HUSL.] September 5, 1942.
- M3 Constant phase shift network to replace simultaneous lobe comparison lag line. Malcolm H. Hebb. [HUSL.] June 30, 1943.
- M4 Constant phase shift network to replace simultaneous lobe comparison lag line. Malcolm H. Hebb. [HUSL.] July 20, 1943.
- M5 Bearing deviation indicator boosters. Frederick V. Hunt. [HUSL.] September 20, 1943.
- M6 Phase sensitivity adapter for direct testing of bearing deviation indicator by monitor. Fred H. Smith. [HUSL.] April 13, 1944.
- M7 Constant resistance network for bearing deviation indicator. Malcolm H. Hebb. [HUSL.] April 30, 1944.
- M8 Bearing deviation indicator phase shift networks for wide frequency range. Claude W. Horton. [HUSL.] May 9, 1944.
- M9 Input phasing of bearing deviation indicator. Charles R. Rutherford. [HUSL.] June 1, 1944.
- M10 Comparison of oscillator tracking of four makes of bearing deviation indicator units. Leonard W. Radmacher. [HUSL.] August 8, 1944.
- M11 Improved doppler control of bearing deviation indicator sensitivity. Stanley R. Rich. [HUSL.] August 31, 1944.

631.421 Model X-3

- M1 Simultaneous lobe comparison, Model X-3A. Charles P. Boner. [HUSL.] April 14, 1943.
- M2 Bearing deviation indicator installation on *USS Semmes*. Isaac P. Rodman. [HUSL.] June 3, 1943.
- M3 [Model] X-3 bearing deviation indicator balance stability. Cassius M. Clay. [HUSL.] January 13, 1944.

- M4 Tests made on [Model] X-3 bearing deviation indicator. Leonard W. Radmacher. [HUSL.] March 18, 1944.

- M5 Method of measuring DB gain reduction of time variation gain on bearing deviation indicator unit, Model X-3. Charles F. Hobbs. [HUSL.] April 1, 1944.

- M6 Method of using notching filter to check bearing deviation indicator oscillator in the field. Robert A. Westervelt. HUSL. July 26, 1944.

- M7 Modernization of bearing deviation indicator, Model X-3, Serial No. 12. Leonard W. Radmacher. [HUSL.] October 27, 1944.

631.422 Model X-4

- M1 Bearing deviation indicator circuit with advantages of [Model] X-4 and sum-difference types. O. Hugo Schuck. [HUSL.] November 9, 1943.
- M2 Bearing deviation indicator [Model] X-4. Fred H. Smith. [HUSL.] December 22, 1943.
- M3 Noise difficulties in bearing deviation indicator receiver [Model] X-4. Malcolm H. Hebb. [HUSL.] February 25, 1944.
- M4 Bearing deviation indicator, Improved circuit for O. Hugo Schuck. [HUSL.] March 14, 1944.
- M5 Bearing deviation indicator improvement. Charles F. Hobbs. [HUSL.] March 15, 1944.
- M6 Comparison of bearing deviation indicator, Model X-4B and Model X-4D. Charles R. Rutherford. [HUSL.] April 28, 1944.
- M7 The time delay in the [Model] X-4 intermediate-frequency amplifier. Nelson M. Blachman. [HUSL.] August 3, 1944.
- M8 Notes on Model X-4 bearing deviation indicator. Charles E. Houston. [HUSL.] September 28, 1944.

631.43 Installations

- M1 Experimental installation of LCA and QC. O. Hugo Schuck. [HUSL.] November 19, 1941.
- M2 Trip for simultaneous lobe comparison installation on *USS Semmes* at New London. Richard N. Lane and O. Hugo Schuck. [HUSL.] June 25, 1942.
- M3 Use of JK with simultaneous lobe comparison. O. Hugo Schuck. [HUSL.] [July, 1942.]
- M4 Trip to *USS Semmes* at New London, August 8 to 13, 1942 inclusive. Robert B. Bowersox. [HUSL.] August 14, 1942.
- M5 Tests on echo-ranging equipment on *USS Neilds*. Charles P. Boner, J. Lewis Hathaway and Charles R. Rutherford. OEMsr-287; Section No. 6.1-sr287-708. HUSL. March 1, 1943.
- M6 Progress report on activities at *Sylph* [during] June, 1943. Carl M. Herget. [HUSL.] July 6, 1943.
- M7 Note on the QJA bearing deviation indicator system. Charles E. Houston. [HUSL.] September 21, 1944.
- M8 Field studies of sonar domes. (n.a.) OEMsr-287;

Section No. 6.1-sr287-2073. HUSL. October 1, 1945.

631.431 QB Gear

- M1 Simultaneous lobe comparison on QBF. O. Hugo Schuck. [HUSL.] September 24, 1942.
- M2 Simultaneous lobe comparison operation with QBF equipment. Robert B. Bowersox and J. Lewis Hathaway. [HUSL.] May 3, 1943.

631.432 QC Gear

- M1 Gyro stabilizing equipment for QC equipped with simultaneous lobe comparison. O. Hugo Schuck. [HUSL.] August 5, 1942.
- M2 QC-JK head on *USS Sylph*. O. Hugo Schuck. [HUSL.] March 5, 1943.
- M3 Installation of bearing deviation indicator with Radio Corporation of America QCJ-8 sound equipment. Charles R. Rutherford and Robert B. Bowersox. [HUSL.] July 12, 1943.
- M4 Installation of bearing deviation indicator with Radio Corporation of America QCQ-2. Charles R. Rutherford and Robert A. Westervelt. [HUSL.] September 6, 1943.
- M5 Adaptation of Astatic, NXss-23438, Bogen, NXss-27819 and Submarine Signal, NXss-25889, bearing deviation indicator production to Submarine Signal QC gear. Herbert R. Stewart. [HUSL.] September 30, 1943.
- M6 Installation of bearing deviation indicator with Radio Corporation of America QCU sound gear. Charles R. Rutherford and Alfred G. Aldridge. [HUSL.] October 18, 1943.

631.433 WEA-1

- M1 Radio Corporation of America echo-ranging equipment, Navy Type CRV. Adaptation to SLCA operation. O. Hugo Schuck. [HUSL.] April 11, 1942.
- M2 Simultaneous lobe comparison for Radio Corporation of America WEA-1 projector. Elimination of relays. Malcolm H. Hebb and Robert B. Bowersox. HUSL. June 12, 1942.
- M3 Trip to New London, July 9 [to] 10, 1942, for observation of simultaneous lobe comparison and WEA-1 on *USS Semmes*. Robert B. Bowersox and O. Hugo Schuck. [HUSL.] July 11, 1942.
- M4 Simultaneous lobe comparison sensitivity. WEA-1 vs QC. O. Hugo Schuck. [HUSL.] November 21, 1942.
- M5 Simultaneous lobe comparison. Direct-connected lead line for WEA-1. Malcolm H. Hebb. [HUSL.] April 2, 1943.
- M6 Installation of bearing deviation indicator on WEA-1 and QCQ-2. Charles R. Rutherford. [HUSL.] August 3, 1943.

631.44 Performance

- M1 Visit to PC-551 [at] Miami. Inspection of simul-

taneous lobe comparison [Model] X-2, No. 1. O. Hugo Schuck. [HUSL.] February 10, 1943.

- M2 BDI indications. Broadside attack. Charles R. Rutherford. [HUSL.] August 2, 1943.
- M3 Technical failures of bearing deviation indicator in Key West. Carl M. Herget. [HUSL.] September 14, 1943.
- M4 Inspection of bearing deviation indicator on *USS Jacob Jones* (DE-130). Cassius M. Clay and Alfred G. Aldridge. [HUSL.] September 20, 1943.
- M5 Bearing deviation indicator, Model X-3. Field tests at Brooklyn Navy Yard. Cassius M. Clay, Leonard W. Radmacher and Robert A. Westervelt. [HUSL.] October 26, 1943.
- M6 Use of bearing deviation indicator in depth charge attacks by relatively inexperienced personnel. Carl M. Herget. [HUSL.] December 29, 1943.
- M7 Bearing deviation indicator and cut-on bearing performance. (n.a.) BuShips. [1944(?)]
- M8 Effect of list of the *USS Lea* (DD-118) on bearing deviation indicator accuracy. Charles E. Houston and Charles R. Rutherford. [HUSL.] July 3, 1944.

631.45 Depth and Azimuth Systems

- M1 Present status of [Project] NO-181 circuits. A. Wilson Nolle. [HUSL.] October 28, 1943.
- M2 Two-dimensional bearing deviation indicator. Charles P. Boner. [HUSL.] January 13, 1944.
- M3 Key West tests on bearing deviation indicator depth determinations on a submarine target. O. Hugo Schuck and Carl M. Herget. HUSL. March 1, 1944.
- M4 Diagonal bearing deviation indicator connection. Harvey A. Brooks. [HUSL.] March 15, 1944.
- M5 Possible simplification of the present [Project NO-] 181 circuits. A. Nelson Butz, Jr. HUSL. March 17, 1944.
- M6 Depth angle, Measurement of Claude W. Horton. [HUSL.] March 20, 1944.
- M7 Depth angle determination. Bearing deviation indicator, both vertical and horizontal. O. Hugo Schuck. [HUSL.] March 26, 1944.
- M8 Simultaneous bearing deviation indicator and depth angle determination with one projector. Malcolm H. Hebb. [HUSL.] March 30, 1944.
- M9 Quadrant-split QBE projector. O. Hugo Schuck. [HUSL.] April 26, 1944.
- M10 Results of simultaneous azimuth and depth angle measurements using quadrant-split crystal projector on *USS Boone* (CG-335). Richard F. Carle. [HUSL.] April 29, 1944.
- M11 Visit of Mr. T. Fry of Fairlie [Laboratory, Great Britain]. Harvey A. Brooks. [HUSL.] May 17, 1944.
- M12 Bearing deviation indicator in depth and azimuth. Input circuit. Malcolm H. Hebb. [HUSL.] June 1, 1944.

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- M13** Bearing deviation indicator patterns of diamond transducers. Gerald I. Harrison. [HUSL.] June 13, 1944.
- M14** Split-square British bearing deviation indicator. Gerald I. Harrison. HUSL. July 1, 1944.
- M15** Hebb method of connecting double bearing deviation indicator to a quadrant-split projector. Robert A. Westervelt and Charles R. Rutherford. [HUSL.] August 15, 1944.
- M16** Methods of connecting bearing and depth deviation indicators to a quadrant-split projector, with notes on depth determination. (n.a.) OEMsr-287; Section No. 6.1-sr287-2072. HUSL. May 1, 1945.
- M17** Dual frequency driver. (n.a.) OEMsr-287; Section No. 6.1-sr287-2083. HUSL. May 25, 1945.
- 631.5 Improved Echo-Ranging Console**
- M1** Possible advantages in improving standard supersonic equipment. (Report No. P5/1571.) Timothy E. Shea. [NLL.] November 13, 1941.
- M2** Echo-ranging equipment. Design modifications. (Report No. P5/2668.) J. Warren Horton. NLL. Revised: April 30, 1942.
- M3** Improved echo-ranging equipment, *USS Sylph*. Transcript of a recorded talk prepared for the Seminar Afloat, July 11, 1943. (Report No. D20/R425.) (n.a.) NLL. [July, 1943.]
- M4** A sensitivity test unit and description of test procedure for the Mark II D-20 rack. (Report No. D20/R460.) Robert J. Callen. NLL. August 9, 1943.
- M5** An improved echo-ranging receiving equipment. (Report No. D20/R1376.) (n.a.) OEMsr-1128; Service Project No. NS-142; Section No. 6.1-sr1128-1941. NLL. February 28, 1945.
- M6** Recommendations for revision of submarine echo-ranging system. (Report No. P29/R1435.) J. Warren Horton. OEMsr-1128; Service Project No. NS-142; Section No. 6.1-sr1128-2219. NLL. May 24, 1945.
- 632.0 QH Sonar**
- M1** Submarine detection. Methods of attack. Harry Nyquist. [Division 6.] October 23, 1941.
- M2** Submarine detection. Sharp selectivity technique. Harry Nyquist. Section No. C4-NDRC-037. [Division 6.] December 24, 1941.
- M3** Sonic location developments. (n.a.) OEMsr-58; Section No. C4-sr58-047. HUSL. December 29, 1941.
- M4** Telegraph theory. Note on limiting signal-noise ratio. Harry Nyquist. [Division 6.] January 2, 1942.
- M5** Submarine detection. Harbor protection. Harry Nyquist. Section No. C4-NDRC-040. [Division 6.] January 5, 1942.
- M6** Submarine detection. Two-dimensional scanning. Harry Nyquist. Section No. C4-NDRC-038. [Division 6.] January 6, 1942.
- M7** Submarine detection. Omnidirectional listening device. Harry Nyquist. Section No. C4-NDRC-041. [Division 6.] January 8, 1942.
- M8** Submarine detection. Comparison of methods of detecting echoes. Harry Nyquist. Section No. C4-NDRC-042. [Division 6.] January 19, 1942.
- M9** Submarine detection, long range. Suggested minimum program of measurements. Harry Nyquist. Section No. C4-NDRC-043. [Division 6.] February 3, 1942.
- M10** Sonavision. Roland K. Blumberg and David C. Whitmarsh. [HUSL.] February 22, 1943.
- M11** Some remarks on the fundamental problem of distinguishing an echo from reverberation in sonar-type devices. Roderic M. Scott. [HUSL.] May 4, 1943.
- M12** Activities at [USS] *Sylph*, June, 1943. Carl M. Herget. [HUSL.] July 6, 1943.
- M13** Sonar production plans. John S. Coleman. [HUSL.] November 23, 1943.
- M14** QH sonar devices being processed. Hayward Henderson. [HUSL.] April 28, 1944.
- M15** Conference with Hector Willis of Fairlie [Laboratory]. O. Hugo Schuck. [HUSL.] June 20, 1944.
- M16** Detection of scanning sonar on submarines by surface vessels. Malcolm H. Hebb. [HUSL.] August 11, 1944.
- M17** Torpedo observation tests on *USS Cythera*, July 20 to August 18, 1944. Frederick E. Lowance, Charles A. Ewaskio and Roger W. Boom. [HUSL.] August 21, 1944.
- M18** Maximum echo ranges and listening ranges for submarine scanning sonar gear. Roderic M. Scott and Thomas P. Merritt. [HUSL.] September 18, 1944.
- M19** Directivity ratio of long sources. Gerald I. Harrison. [HUSL.] October 9, 1944.
- M20** Figure of merit of QH gear. Charles A. Ewaskio. [HUSL.] November 1, 1944.
- M21** Spotting with QH sonar. Harold P. Knauss. [HUSL.] December 21, 1944.
- M22** A statistical theory of errors in pattern formation. (Bi-weekly report covering period December 24, 1944 [to] January 6, 1945.) (n.a.) OEMsr-287; Section No. 6.1-sr287-1964. HUSL. January 8, 1945. pp. 1-4, 7-9.
- M23** Torpedo detection with QH sonar. (n.a.) OEMsr-287; Section No. 6.1-sr287-1954. HUSL. January 15, 1945.
- M24** Intensity of a target echo. Charles E. Houston. [HUSL.] April 16, 1945.
- 632.01 Pulse Transmitters**
- M1** Data and operating instructions for 1.5-kw power amplifier. Neil E. Handel. [HUSL.] March 24, 1943.
- M2** Pulse shaping for high-duty cycle circuits. Frederick V. Hunt. [HUSL.] July 4, 1943.

- M3 Sharp pulse high-power transmitters. Nelson A. Butz, Jr. and F. Burton Jones. [HUSL.] December 4, 1943.
- M4 Magnetostriction transducers and high-power supersonic pulsing. Frederick V. Hunt, Roger Hickman and others. [HUSL.] March 4, 1944.
- M5 Pulse tailoring for sonar systems. Frederick V. Hunt. [HUSL.] August 12, 1944.
- M6 Temperature compensation of QH sonar oscillator. Robert L. Cummerow. [HUSL.] September 21, 1944.
- M7 Five-millisecond pulse high-power transmitter for ER sonar equipment aboard the *Aide de Camp*. David C. Whitmarsh and Andrew Patterson, Jr. HUSL. January 17, 1945.
- M8 On the so-called bump-back filter advocated by Professor Jones. Claude W. Horton. HUSL. June 11, 1945.
- M9 Tailored pulses in sonar transmitters. Frederick V. Hunt. [HUSL.] July 10, 1945.

632.02 Sweep Circuits and Timers

- M1 Electronic spiral sweep. David C. Whitmarsh and Roland K. Blumberg. [HUSL.] January 27, 1943.
- M2 Developments in spiral sweeps. F. Burton Jones and Roderic M. Scott. [HUSL.] March 13, 1943.
- M3 Linear sweeps. F. Burton Jones and Reubin H. Wallace. [HUSL.] October 5, 1943.
- M4 Stable-extended range linear sweeps. F. Burton Jones and Reubin H. Wallace. [HUSL.] November 11, 1943.
- M5 Spiral sweep synchros at 30 rps. F. Burton Jones. [HUSL.] January 14, 1944.
- M6 Mechanical sweep circuit. Kenneth N. Fromm. [HUSL.] March 20, 1944.
- M7 Sangamo timer. J. Lewis Hathaway. [HUSL.] April 4, 1944.
- M8 ER spiral sweep experiences and comments. Stanley R. Rich. [HUSL.] May 8, 1944.
- M9 Modifications to ER spiral sweep. Stanley R. Rich. [HUSL.] May 29, 1944.
- M10 Pro-submarine timer. Reubin H. Wallace. [HUSL.] November 8, 1944.

632.03 Receiver Systems

- M1 Receiver for [USS] *Semmes* installation. *Aide de Camp* field trip of October 7, 1943. Roderic M. Scott. [HUSL.] October 8, 1943.
- M2 Measurements on the tuned radio frequency amplitude receiver. Andrew Patterson, Jr. [HUSL.] October 19, 1943.
- M3 Comparison of three scanning sonar input systems. J. Lewis Hathaway. [HUSL.] January 7, 1944.
- M4 Results of tests of the second sonar console listening amplifier after the final changes have been made in the circuit, March 11, 1944. Frank S. Replogle. [HUSL.] March 11, 1944.
- M5 Status report on Task No. 5. Effect of short pulse lengths and receiver bandwidth on echo ranging.

(Report No. 3510-RWK-HP.) Robert W. Kirkland. BTL. July 15, 1944.

- M6 Loud-speakers for sonar equipment. Neil E. Handel and John D. Watt. [HUSL.] November 18, 1944.
- M7 Sonar preamplifier band-pass filter. John O. Hancock. [HUSL.] January 10, 1945.
- M8 Appendix to John Hancock's memorandum: Sonar preamplifier band-pass filter. Malcolm H. Hebb. [HUSL.] January 18, 1945.
- M9 Answer to: Thyrite protection for input circuits, by Frederick V. Hunt, March 5, 1945. Robert B. Bowersox. [HUSL.] March 6, 1945.
- M10 Effect of band-pass filters on a pulse. Gerald I. Harrison. [HUSL.] March 20, 1945.
- M11 Pro-submarine receivers. Arthur C. Clatfelter. [HUSL.] April 13, 1945.

632.04 Indicators and Recorders

- M1 Repetition of CRO echo indications. Harold P. Knauss. [HUSL.] May 28, 1943.
- M2 Mechanical recorder for sonar. John D. Lane. [HUSL.] June 12, 1943.
- M3 Conference on sonar display with J. W. Horton at New London, July 19, 1943. William T. Bartholomew and Harold P. Knauss. [HUSL.] July 22, 1943.
- M4 San Diego range marking system. Harold P. Knauss. [HUSL.] September 22, 1943.
- M5 Tests on the magnetic compass follower. Roderic M. Scott. [HUSL.] October 22, 1943.
- M6 Chemical recorder, bearing repeater and automatic training applied to sonar. J. Lewis Hathaway. [HUSL.] November 11, 1943.
- M7 Status of scanning sonar display and fire control problems. Harold P. Knauss and William T. Bartholomew. [HUSL.] January 20, 1944.
- M8 A continuous range and bearing mechanical indicator. John D. Lane. [HUSL.] April 13, 1944.
- M9 Plan position indicator tube size demonstration. Robert B. Bowersox and Harold P. Knauss. [HUSL.] May 12, 1944.
- M10 Mechanical oscilloscope for QH sonar. William T. Bartholomew. [HUSL.] May 24, 1944.
- M11 Use of chemical range recorder with QH sonar. Harold P. Knauss. [HUSL.] May 26, 1944.
- M12 Plan position indicator bearing accuracy on 5-inch, 7-inch and 12-inch scopes. Roger W. Boom. [HUSL.] May 31, 1944.
- M13 The range marking circuit for the scanning submarine system. Norman B. Saunders. [HUSL.] August 17, 1944.
- M14 The range marking circuit for the scanning submarine system. (Revised.) Norman B. Saunders. [HUSL.] September 6, 1944.
- M15 Sangamo's cursors and range recorder. Frederick V. Hunt. [HUSL.] October 20, 1944.
- M16 Cursor design and angle subtended by a submarine. Harold P. Knauss. [HUSL.] November 1, 1944.

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- M17** Cursor design. Frederick V. Hunt. [HUSL.] November 3, 1944.
- M18** Submarine sonar system range marking circuit. Tentative instructions for calibration and a more detailed explanation of the operation of the sweep circuit. Norman B. Saunders. [HUSL.] November 3, 1944.
- M19** Continuously visible electronic cursor. Harold P. Knauss. [HUSL.] March 12, 1945.
- 632.05 Attack Teachers and Plotters**
- M1** Changes made in the General Electric attack plotter, known as the ASAP. Robert B. Bowersox. [HUSL.] March 19, 1945.
- M2** The ASAP installation on the *USS Cythera*. Robert H. Hughes. [HUSL.] April 17, 1945.
- M3** Operator training equipment, Model 5. Modification of Sangamo QFA-5 attack teacher and associated equipment for scanning sonar training. (n.a.) OEMsr-287; Section No. 6.1-sr287-2062. HUSL. November 1, 1945.
- 632.06 Monitor and Test Equipment**
- M1** Sonar signal interjector. Frederick V. Hunt. [HUSL.] November 18, 1943.
- M2** Comments on the monitor hoist to be installed on the [USS] *Cythera*. Roderic M. Scott. [HUSL.] February 26, 1944.
- M3** Additional comments on the monitor hoist which has been installed on the [USS] *Cythera*. Roderic M. Scott. [HUSL.] March 13, 1944.
- M4** ISGM procedure for tuning driver and receiver quickly under way. O. Hugo Schuck. [HUSL.] March 21, 1944.
- M5** Scanning sonar pattern computer. O. Hugo Schuck. [HUSL.] October 23, 1944.
- M6** Plotting of scanning sonar transducer pattern on equipment scope. Charles R. Rutherford. [HUSL.] November 9, 1944.
- M7** Design of potentiometer phase shifter for phase measurements over a broad frequency band. Robert L. Cummerow. [HUSL.] March 5, 1945.
- M8** Polar inverse exponential pattern plotter for ER sonar, PE-1PPER. Norman B. Saunders. [HUSL.] March 6, 1945.
- 632.1 Mechanical Rotation System (MR) (Rotoscope)**
- 632.11 Circuits and Design**
- M1** Electronic problems of MR sonar. Harold P. Knauss. [HUSL.] August 28, 1942.
- M2** MR sonar status. Harold P. Knauss. [HUSL.] September 4, 1942.
- M3** Status report [of] MR sonar. Harold P. Knauss and James F. Bacon. [HUSL.] September 26, 1942.
- M4** Rotoscope. Report on Tippy model. Harold P. Knauss. [HUSL.] October 6, 1942.
- M5** Rotoscope conference, November 12 and 13, 1942. Harold P. Knauss. [HUSL.] November 14, 1942.
- M6** Proposed rotoscope for detection of small targets at short ranges. Harold P. Knauss. [HUSL.] November 21, 1942.
- M7** Installation of rotoscope. Harold P. Knauss. [HUSL.] December 15, 1942.
- M8** Range accuracy and range scale for rotoscope. Harold P. Knauss. [HUSL.] January 11, 1943.
- M9** The rotoscope and the status of MR and ER sonar research. Harold P. Knauss. [HUSL.] January 18, 1943.
- M10** Commutated rotation sonar. Harold P. Knauss. [HUSL.] May 5, 1943.
- M11** An anecdotal history of the rotoscope, to December 28, 1942. Harold P. Knauss. [HUSL.] June 18, 1943.
- M12** Sonic locator developments. [Part] II, MR sonar [and] the rotoscope. Harold P. Knauss. OEMsr-287; Section No. 6.1-sr287-1346. HUSL. February 5, 1944.
- M13** Rotoscope conference, September 16, 1942. Harold P. Knauss. [HUSL.] (n.d.)
- 632.12 Performance Tests**
- M1** Field test on Monday, July 27, 1942. Harold P. Knauss. [HUSL.] July 27, 1942.
- M2** MR sonar as listening device. Field tests of August 21, 1942. O. Hugo Schuck, James F. Bacon and others. [HUSL.] August 27, 1942.
- M3** Pleasure Bay, September 15, 1942. Harold P. Knauss and Roland K. Blumberg. [HUSL.] September 16, 1942.
- M4** Rotoscope field trip off Spectacle Island, Friday, September 18, 1942. Harold P. Knauss. [HUSL.] September 21, 1942.
- M5** Rostroscope field test, September 23, 1942. Harold P. Knauss and Arthur L. Besse, Jr. [HUSL.] September 24, 1942.
- M6** Construction and characteristics of the MR sonar 12x12-inch hydrophone. Francis P. Bundy. [HUSL.] October 19, 1942.
- M7** Rotoscope field trip, November 6, 1942. Harold P. Knauss. [HUSL.] November 6, 1942.
- M8** Rotoscope field trip, December 19, 1942, Egg Rock. Harold P. Knauss. [HUSL.] December 22, 1942.
- M9** Rotoscope field trips, December 29 and 30 [1942] and January 2, 4 and 5, 1943. Harold P. Knauss. [HUSL.] January 5, 1943.
- M10** Rotoscope field tests, January 8, 1943, off Mahant. Harold P. Knauss. [HUSL.] January 8, 1943.
- M11** Demonstrations of the rotoscope, Friday, March 12 and Monday, March 15, 1943. Harold P. Knauss. [HUSL.] March 16, 1943.
- M12** Rotoscope trip to Gloucester and return. David C. Whitmarsh. [HUSL.] May 10, 1943.
- M13** The trip of the *Aide de Camp*, May 12, 1943. Roderic M. Scott. [HUSL.] May 13, 1943.
- M14** Final tests on the rotoscope. F. Burton Jones and David C. Whitmarsh. [HUSL.] June 16, 1943.

632.2 Capacitive Rotation System (CR)

632.21 Experimental Systems

- M1 Roll, pitch and mast deflection characteristics. (Division 14.) G. J. Maslach. MIT, Radiation Laboratory. December 15, 1943.

632.211 Circuits and Designs

- M1 Knauss' memorandum on sonar program, dated January 25 [1943]. Frederick V. Hunt. [HUSL.] January 31, 1943.
- M2 Simultaneous lobe comparison brightening for CR sonar. F. Burton Jones and Roderic M. Scott. [HUSL.] May 28, 1943.
- M3 CR sonar electronics. Roderic M. Scott and Harold P. Knauss. [HUSL.] June 15, 1943.
- M4 CR sonar electronics conference, June 16, 1943. Harold P. Knauss. [HUSL.] June 19, 1943.
- M5 Range marking circuit for CR sonar. Kenneth N. Fromm. [HUSL.] July 6, 1943.
- M6 Laboratory tests of simultaneous independent lobe comparison for CR sonar at 23 kc. F. Burton Jones and Reubin H. Wallace. [HUSL.] August 20, 1943.
- M7 Conference on Sangamo specifications for CR sonar. Harold P. Knauss. [HUSL.] February 1, 1944.
- M8 Air gap tolerances on commutators for CR scanning sonar. Clifford M. Wallis. [HUSL.] June 29, 1944.
- M9 Capacitive commutators. F. Burton Jones and Reubin H. Wallace. [HUSL.] October 5, 1944.

632.212 Performance Tests

- M1 Field test on *Medusa*. Roderic M. Scott and F. Burton Jones. [HUSL.] October 2, 1942.
- M2 *Medusa*. Roderic M. Scott and F. Burton Jones. [HUSL.] October 13, 1942.
- M3 Tests on simultaneous lobe comparison brightening. Roderic M. Scott and F. Burton Jones. [HUSL.] May 8, 1943.
- M4 Field trip of July 12, 1943. Roderic M. Scott. [HUSL.] July 13, 1943.
- M5 Progress on the *Aide de Camp* up to Friday, September 24 [1943]. Roderic M. Scott. [HUSL.] September 24, 1943.
- M6 Preliminary returns of the field trip of the *Aide de Camp* to New London. Roderic M. Scott. [HUSL.] November 12, 1943.
- M7 New London results. [Part] III, Sensitivity of CR sonar. Roderic M. Scott and Charles A. Ewaskio. [HUSL.] December 10, 1943.
- M8 New London results. [Part] IV.) Roderic M. Scott and Charles A. Ewaskio. [HUSL.] December 16, 1943.
- M9 *Aide de Camp* field trip, December 29, 1943. David C. Whitmarsh. [HUSL.] December 29, 1943.
- M10 CR/ER sonar installation on *USS Sardonyx*.

Titled: Information on installation and operation of CR/ER sonar, Model No. 1, Serial No. 1. This memorandum applies only to the *USS Sardonyx* installation made on February 21, 1944. (n.a.) HUSL. February 21, 1944.

- M11 CR sonar, QH sonar, demonstration on the [USS] *Sardonyx*, February 16 to March 3 [1944]. Robert B. Bowersox. [HUSL.] March 9, 1944.
- M12 Bearing accuracy of QH, Model 1. Harold P. Knauss. [HUSL.] June 19, 1944.
- M13 QH sonar, Model 2, Serial 1. Installation on *USS Cythera*. Titled: Information on installation and operation of QG sonar, Model No. 2, Serial No. 1. This memorandum applies only to the installation aboard *USS Cythera* begun September 13, 1944. (n.a.) [HUSL.] September 13, 1944.
- M14 Status of QH sonar Model 2 aboard *USS Cythera*, PY31. J. Lewis Hathaway, William C. Marlow and others. [HUSL.] September 30, 1944.
- M15 Field tests on [USS] *Cythera*, October 4, 1944. Charles A. Ewaskio, Frederick E. Lowance and others. [HUSL.] October 5, 1944.
- M16 QH sonar revisions and measurements [at] New London. Arthur C. Clatfelter and Aaron B. Powers. [HUSL.] October 19, 1944.
- M17 Variation in visual and audio echoes with QH Model II in shallow water. Frederick E. Lowance, Charles A. Ewaskio and Robert H. Hughes. [HUSL.] November 8, 1944.
- M18 Power output of QH Model II and sensitivity of installed monitor on the [USS] *Cythera*. Charles A. Ewaskio. [HUSL.] November 10, 1944.
- M19 Figure of merit vs ship's speed. Figure of merit of QH Model II on November 19, 1944. Charles A. Ewaskio. [HUSL.] November 22, 1944.
- M20 Variation in visual and audio echoes with QH Model II in deep water. Charles A. Ewaskio and Frederick E. Lowance. [HUSL.] December 9, 1944.

632.22 XQHA (Sangamo)

632.221 Circuits and Designs

- M1 Conference with Sangamo Electric Company representatives, February 29 [1944]. Harold P. Knauss. [HUSL.] March 2, 1944.
- M2 Two-channel preamplifier for XQHA-BDI. Leon G. S. Wood. HUSL. March 22, 1945.
- M3 Project report and instruction book for Model XQHA sonar equipment. (Serial No. 106.) (n.a.) OEMsr-1288 and NXsr-46933, Task No. 2; Section No. 6.1-sr1288-2117. Sangamo Electric Company. April, 1945(?)
- M4 Recommendations on attenuation and lag lines for the Sangamo XQHA system. Gerald I. Harrison. [HUSL.] April 2, 1945.
- M5 Results of measurements on two-channel preamplifier for XQHA-BDI. Leon G. S. Wood. [HUSL.] April 10, 1945.

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- M6 Design B for scanning sonar XQHA. Gerald I. Harrison. [HUSL.] April 14, 1945.

632.222 Performance Tests

- M1 Tests of the partially complete Sangamo XQHA system at the HUSL Barge. Francis P. Bundy. [HUSL.] March 1, 1945.
- M2 Activities on *USS Babbitt*, for the week of February 26 [to] March 3, 1945. Charles E. Houston. [HUSL.] March 6, 1945.
- M3 Activities on *USS Babbitt*, March 6 [to] 10, 1945, inclusive. Charles E. Houston. [HUSL.] March 13, 1945.
- M4 Tests to be made on XQHA System No. 1 on *USS Galaxy*. O. Hugo Schuck and Leon G. S. Wood. [HUSL.] March 16, 1945.
- M5 Activities on *USS Babbitt*, March 12 to March 17, 1945, inclusive. Charles E. Houston. [HUSL.] March 20, 1945.
- M6 Activities on the *USS Babbitt* from March 19 to March 31, 1945. Charles E. Houston. [HUSL.] April 3, 1945.
- M7 Tests to be made on XQHA aboard *USS Galaxy* after installation of dual-channel preamplifier. Leon G. S. Wood. [HUSL.] April 4, 1945.
- M8 Evaluation of measurements made on XQHA System No. 1 on *USS Galaxy*, March 19 to March 28, 1945. Robert E. Kirkland. [HUSL.] April 24, 1945.
- M9 Scanning sonar XQHA. Bearing deviation indicator operational tests. O. Hugo Schuck. [HUSL.] April 29, 1945.
- M10 Application of bearing deviation indicator to XQHA. Tests. Robert E. Kirkland. [HUSL.] May 7, 1945.
- M11 Correction of Graph No. 7 of memorandum: Evaluation of measurements made on XQHA on *USS Galaxy*, March 19 to 29, 1945 and April 24, 1945. Robert E. Kirkland. [HUSL.] May 14, 1945.
- M12 Interference measurements on *USS Galaxy* and *USS Babbitt*, April 3 to April 10, 1945. Charles E. Houston. [HUSL.] May 31, 1945.
- M13 Operational accuracy of XQHA; with and without bearing deviation indicator; with stationary echo-repeater target. Robert E. Kirkland. [HUSL.] June 13, 1945.

632.3 Electrical Rotation System (ER) (Submarine)

632.31 Experimental Systems

632.311 Circuits and Designs

- M1 Sonar conference of October 14, 1942. Harold P. Knauss. [HUSL.] October 15, 1942.
- M2 Sonar conference, October 28, 1942. Harold P. Knauss. [HUSL.] October 29, 1942.
- M3 Present status of the ER sonar department. Roderic M. Scott and F. Burton Jones. [HUSL.] January 8, 1943.

- M4 ER sonar. A new sharp beam system. Stanley R. Rich. [HUSL.] July 12, 1943.
- M5 Simultaneous lobe comparison without the S. A new pattern comparison scheme for ER sonar. Stanley R. Rich. [HUSL.] August 20, 1943.
- M6 Pro-submarine requirements. F. Burton Jones. [HUSL.] January 15, 1944.
- M7 Tentative research program for sonar. Points to be discussed at the first meeting of the Program Committee. Roderic M. Scott. [HUSL.] January 19, 1944.
- M8 Tentative specifications [of] pro-submarine electronic equipment. J. Lewis Hathaway. [HUSL.] July 12, 1944.
- M9 Meeting in New York office on submarine sonar program, September 7, 1944. Charles P. Boner. [HUSL.] September 8, 1944.
- M10 Program and work schedule for submarine scanning sonar. Roderic M. Scott. [HUSL.] November 2, 1944.
- M11 Theory of ER sonar. Gerald I. Harrison. [HUSL.] December 11, 1944.
- M12 Instruction manual for submarine scanning sonar system XQHA. (n.a.) HUSL. February, 1945.
- M13 Alignment of the electronic timer and range marking circuit of the submarine scanning sonar system, Model II. Norman B. Saunders. [HUSL.] April 9, 1945.
- M14 ER sonar installation on *USS Dolphin*. Robert B. Bowersox, Reubin H. Wallace and Andrew Patterson, Jr. [HUSL.] April 10, 1945.
- M15 Operating instructions for ER sonar switching test unit. (n.a.) [HUSL.] June 14, 1945.

632.312 Performance Tests

- M1 ER sonar field trip off Spectacle Island. Roderic M. Scott and Harold P. Knauss. [HUSL.] October 16, 1942.
- M2 ER sonar field trip, October 20, 1942, off Spectacle Island. Roderic M. Scott and Harold P. Knauss. [HUSL.] October 20, 1942.
- ✓ M3 New London results. [Part] II, Event B, November 3, 1943; ER sonar. Roderic M. Scott. [HUSL.] November 17, 1943.
- M4 Field trip of the *Aide de Camp*, August 5, 1944 David C. Whitmarsh. [HUSL.] August 7, 1944.
- M5 The 53-kc ER sonar system at Mountain Lakes Reference Laboratory. Thomas P. Merritt and Arthur C. Clatfelter. [HUSL.] August 21, 1944.
- M6 The 53-kc ER sonar system on board the *Aide de Camp* at New London. Thomas P. Merritt, Arthur C. Clatfelter and David C. Whitmarsh. [HUSL.] August 28, 1944.
- M7 The 3-foot sphere echo-ranging data. Thomas P. Merritt, David C. Whitmarsh and Roderic M. Scott. [HUSL.] November 10, 1944.
- M8 Installation and tests of the XQKA scanning sonar system on *USS Dolphin*. Andrew Patterson, Jr. [HUSL.] May 30, 1945.

- M9 Dentuda tests of scanning sonar XQKA. [Roderic M. Scott.] [HUSL.] (n.d.)

632.4 Composite Systems

632.41 Ultimate Systems

- M1 Relationships between ship and true coordinates. (Division 14. Report No. 8.) W. A. Mersman. MIT, Radiation Laboratory. April 8, 1944.
- M2 Combined minutes of series of conferences held in Washington, July 13-15, 1944. (n.a.) HUSL. July 17, 1944.
- M3 Minutes of second conference on ultimate sonar system, held July 27, 1944. (n.a.) HUSL. July 27, 1944.
- M4 Trip to Washington and conference there on fire-control equipment for ultimate sonar, November 21, 1944. Robert B. Watson. [HUSL.] November 24, 1944.
- M5 Minutes of tenth conference on integrated sonar systems, held February 1, 1945. (n.a.) HUSL. February 8, 1945.
- M6 Minutes of eleventh conference on integrated sonar systems, held March 1, 1945. (n.a.) HUSL. March 8, 1945.
- M7 Integrated sonar system. Hayward W. Henderson. [HUSL.] March 12, 1945.
- M8 Integrated B sonar, Sweep requirements for Norman B. Saunders. [HUSL.] March 14, 1945.
- M9 Minutes of twelfth conference on integrated sonar systems, held March 29, 1945. (n.a.) HUSL. April 19, 1945.

632.42 Depth-Scanning Sonar (Integrated Type B)

632.421 Circuits and Designs

- M1 Depth determination with QH sonar. Roderic M. Scott. [HUSL.] April 12, 1944.
- M2 Depth-scanning sonar. Material for acoustic lens. Norman B. Saunders. [HUSL.] June 30, 1944.
- M3 Depth-scanning sonar. Proposed system, as of July 3, 1944. O. Hugo Schuck. [HUSL.] July 3, 1944.
- M4 Acoustic lens scanning sonar system. O. Hugo Schuck. [HUSL.] July 17, 1944.
- M5 Stabilization system for depth-scanning sonar. Robert B. Watson. [HUSL.] August 4, 1944.
- M6 Fire-control sonar. Critique on depth-scanning system. O. Hugo Schuck. [HUSL.] August 7, 1944.
- M7 Depth-scanning sonar indicator, Orthogonalization of O. Hugo Schuck. [HUSL.] September 12, 1944.
- M8 Notes on details of depth-scanning console. Hayward W. Henderson. [HUSL.] September 28, 1944.
- M9 Ultimate system scanning sonar. Own-doppler nullifier considerations. O. Hugo Schuck. [HUSL.] October 17, 1944.
- M10 Directional transmission for depth scanning.

Frederick V. Hunt. [HUSL.] February 15, 1945.

- M11 Scanning sonar, Directional transmitting beam for O. Hugo Schuck. [HUSL.] February 19, 1945.
- M12 QH depth-scanning sonar. Experimental model. Installation on *USS Cythera*. (n.a.) [HUSL.] March 1, 1945.
- M13 Depth-scanning sonar, Proposed system [for] Robert B. Watson. [HUSL.] March 3, 1945.
- M14 Integrated B sonar, Sweep requirements for O. Hugo Schuck. [HUSL.] March 8, 1945.
- M15 Directional transmission for depth scanning. Robert B. Watson. [HUSL.] April 5, 1945.
- M16 Experimental work on orthogonalization. Robert H. Hughes. [HUSL.] April 11, 1945.
- M17 Cable for ultimate Type B and submarine systems. Robert B. Watson. [HUSL.] April 12, 1945.
- M18 Arrangement for beam-forming transmission for depth scanning. Robert B. Watson. [HUSL.] April 13, 1945.

632.422 Performance Tests

- M1 Acoustical power and figure of merit of 26-kc DSS system and bottom echo strength. Charles A. Ewaskio. [HUSL.] February 12, 1945.
- M2 Measurements on the 26-kc depth-scanning system on *USS Cythera*. Robert B. Watson. [HUSL.] February 17, 1945.
- M3 Measurements made with 26-kc DSS on *USS Cythera*. Target strength of *Vortice*, Italian submarine, 250-ft long. Target strength of bottom at 90-degrees depression angle. Charles A. Ewaskio. [HUSL.] February 21, 1945.
- M4 Log of Harvard Underwater Sound Laboratory observations, *USS Cythera*, February 8 to 12, 1945. Cassius M. Clay. [HUSL.] March 3, 1945.
- M5 Measurements of the depth-scanning system on *USS Cythera*. Robert B. Watson. [HUSL.] March 8, 1945.
- M6 Log of Harvard Underwater Sound Laboratory operations on *USS Cythera*, February 13 through February 17 [1945]. Robert C. Morton. [HUSL.] March 8, 1945.
- M7 Log of Harvard Underwater Sound Laboratory operations on *USS Cythera*, February 27 [through] March 3, 1945. Neil E. Handel. [HUSL.] March 10, 1945.
- M8 Transmitting patterns for installed depth-scanning transducer on *USS Cythera*. Robert B. Watson. [HUSL.] March 14, 1945.
- M9 Study of differences between commutators No. 1 and No. 2 of the depth-scanning system. Robert H. Hughes. [HUSL.] March 23, 1945.
- M10 [Tests] on *USS Cythera*. Charles R. Rutherford. [HUSL.] April 11, 1945.
- M11 Strength of ocean bottom echoes off Florida east coast using 26-kc DSS. Cassius M. Clay and Robert A. Westervelt. [HUSL.] May 24, 1945.

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M12 Vertical patterns and ping pressures of transmitting beams, 26-kc DSS, on *USS Cythera*. Charles R. Rutherford, Cassius M. Clay and Robert A. Westervelt. [HUSL.] May 28, 1945.

M13 Submarine runs with directional and non-directional transmitting beams, 26-kc DSS, on *USS Cythera*. Cassius M. Clay. [HUSL.] June 18, 1945.

632.5 Transducers

632.51 Magnetostrictive

M1 Sonar-lamination dimensions as functions of the number of sections. Nelson M. Blachman. [HUSL.] June 26, 1944.

M2 Construction and performance of HP-4, No. 5, experimental scanning sonar stack. Francis P. Bundy and Milton Carlson. [HUSL.] July 26, 1944.

M3 The scanning sonar depth angle transducer lamination. Nelson M. Blachman. [HUSL.] August 18, 1944.

M4 Transmission measurements on HP-1 and HP-2. F. Burton Jones, Cedric E. Hesthal and others. [HUSL.] September 8, 1944.

M5 Acoustic patterns of the HP-2B scanning sonar transducer on the *USS Cythera*. Harold P. Knauss, Aaron B. Powers and Francis P. Bundy. [HUSL.] October 10, 1944.

M6 Artificial transducers for scanning sonar. Robert E. Payne. [HUSL.] October 30, 1944.

M7 The 26-kc projectors for [the] *Aide de Camp*. Gerard W. Renner. [HUSL.] November 2, 1944.

M8 Construction and first tests of the magnetostrictive scanning sonar transducer, HP-3DS. Robert B. Watson and Francis P. Bundy. [HUSL.] December 13, 1944.

M9 Construction and first tests of magnetostrictive scanning sonar transducer, HP-8D, No. 2. Leon W. Camp and Robert B. Watson. [HUSL.] July 3, 1945.

M10 Instruction manual for HP-5 trainable artificial transducer, Model 1. (n.a.) HUSL. July 15, 1945.

632.52 Piezoelectric

M1 Tests on the 36-element X-cut crystal sonar transducer built by the San Diego Laboratory. [Robert E. Payne.] [HUSL.] September 27, 1943.

M2 Pattern tests on CP1-1, No. 770, San Diego 36-element crystal transducer. William T. Bartholomew, Julius O. Natwick and Harold P. Knauss. [HUSL.] October 21, 1943.

M3 Further tests on CP1-1, No. 770, crystal transducer. Harold P. Knauss. [HUSL.] November 5, 1943.

M4 Tests on CP1-1, No. 770, crystal transducer. ([Part] III.) Harold P. Knauss. [HUSL.] November 22, 1943.

M5 Data obtained from Brush AX-104, crystal transducer. Thomas P. Merritt. [HUSL.] June 14, 1944.

M6 Spy Pond measurements on AX-132, No. 1.

Thomas P. Merritt and Roderic M. Scott. [HUSL.] December 26, 1944.

M7 Preliminary measurements made at Spy Pond on AX-136, No. 1. Robert B. Bowersox. [HUSL.] March 6, 1945.

M8 Submarine transducers and lighting systems. Harold E. Nash. [HUSL.] March 15, 1945.

M9 Preliminary measurements made at Spy Pond on AX-132, No. 2. Stanley R. Rich. [HUSL.] March 26, 1945.

M10 Tests on Brush AX-132, No. 3. James J. Faran, Jr. [HUSL.] April 27, 1945.

M11 Tests on Brush AX-132, No. 5. James J. Faran, Jr. [HUSL.] April 28, 1945.

M12 Reason for return of AX-136, No. 3 transducer to Brush. James J. Faran, Jr. [HUSL.] May 4, 1945.

M13 Tests on Brush AX-132, No. 6. James J. Faran, Jr. [HUSL.] May 9, 1945.

M14 Tests of transducer No. 6. J. S. Martin. [Sangamo Electric Company.] May 9, 1945.

M15 Tests on Brush AX-136, No. 2. James J. Faran, Jr. [HUSL.] May 16, 1945.

M16 Tests on Brush AX-132, No. 4. James J. Faran, Jr. [HUSL.] May 23, 1945.

M17 Tests on Brush AX-136, No. 4. James J. Faran, Jr. [HUSL.] June 4, 1945.

M18 Further tests on Brush AX-136, No. 2. James J. Faran, Jr. [HUSL.] June 6, 1945.

M19 Tests on Brush AX-136, No. 5. James J. Faran, Jr. [HUSL.] June 11, 1945.

M20 Efficiency of AX-136 transducers. Harold E. Nash. [HUSL.] June 21, 1945.

632.53 Transducer Cables

M1 Water seal for 100-conductor cable. Alan H. Selker. [HUSL.] December 6, 1944.

M2 Cable seals for HP-8 cable. Hugh E. Harlow. [HUSL.] January 3, 1945.

M3 Trip to Bell Telephone Laboratories on the question of HP-8 cable. Hugh E. Harlow. [HUSL.] January 15, 1945.

M4 Cable for depth scanning transducer supplied by Collyer Wire and Cable. Robert B. Watson. [HUSL.] March 1, 1945.

M5 Method for sealing Collyer 50-pair flexible, blocked cable. Alan H. Selker. [HUSL.] March 9, 1945.

M6 Scanning sonar transducer cable. Hugh E. Harlow. [HUSL.] May 11, 1945.

632.6 Beam Formation and Rotation

632.61 Theory

M1 Scanning sonar doppler due to rotation of pattern. Gerald I. Harrison. [HUSL.] May 10, 1944.

M2 Appearance of 90° minor lobes in scanning sonar transducer patterns. Thomas P. Merritt and Francis P. Bundy. [HUSL.] May 13, 1944.

M3 Single element scanning sonar patterns. Gerald I. Harrison. [HUSL.] November 24, 1944.

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- M4 Theoretical scanning sonar patterns. Gerald I. Harrison. [HUSL.] January 19, 1945.
- M5 Transmission pattern for constant echo strength. Gerald I. Harrison. [HUSL.] March 26, 1945.
- M6 Scanning sonar pattern formation. Gerald I. Harrison. [HUSL.] April 14, 1945.
- M7 Theoretical scanning sonar patterns. Gerald I. Harrison. [HUSL.] April 16, 1945.
- M8 Further subdivision of scanning rotor to achieve more uniform rotation of beam. Malcolm H. Hebb. [HUSL.] April 19, 1945.

632.62 Network Design

- M1 Line-type modulators. O. Hugo Schuck and Harold P. Knauss. [HUSL.] August 11, 1943.
- M2 The π lag section charts. Nelson M. Blachman. [HUSL.] January 28, 1944.
- M3 A low-frequency modulator. John L. Evers and Stanley R. Rich. [HUSL.] May 10, 1944.
- M4 Artificial line of low-distortion. Claude W. Horton. [HUSL.] May 12, 1944.
- M5 Artificial line of low-distortion, Design of Claude W. Horton. [HUSL.] May 23, 1944.
- M6 Depth-scanning sonar. Phasing network for a two-dimensional array of transducers. Norman B. Saunders. [HUSL.] June 23, 1944.
- M7 Artificial line of low-distortion, A new Claude W. Horton. [HUSL.] August 21, 1944.
- M8 M-derived filters, Notes on Claude W. Horton. [HUSL.] September 8, 1944.
- M9 A lead line with attenuation. Nelson M. Blachman. [HUSL.] October 12, 1944.
- M10 More artificial lines with linear phase shifts. Claude W. Horton. [HUSL.] October 18, 1944.
- M11 Power supply, Use of artificial lines as a Claude W. Horton. [HUSL.] November 1, 1944.
- M12 Harrison's 180° reversals. Stanley R. Rich. [HUSL.] December 8, 1944.
- M13 High-voltage pulse line. Robert E. Payne. [HUSL.] February 22, 1945.
- M14 A defense of constant-k pulse lines and their designer. Robert E. Payne. [HUSL.] February 27, 1945.
- M15 Low-impedance pulsing storage lines for submarine sonar. Francis R. Nitchie, Jr. [HUSL.] June 11, 1945.
- M16 Miscellaneous studies in electrical transmission networks. (n.a.) OEMsr-287; OSRD No. 6582; Section No. 6.1-sr287-2088. HUSL. November 15, 1945.

632.63 Rotor Design

- M1 *Medusa*. Roderic M. Scott and F. Burton Jones. [HUSL.] October 8, 1942.
- M2 DC pulse generators. F. Burton Jones and Reubin H. Wallace. [HUSL.] July 16, 1943.
- M3 A new switching system for ER sonar. Stanley R. Rich. [HUSL.] February 22, 1944.
- M4 Varistors as gain controls. Stanley R. Rich and William L. Detwiler. [HUSL.] June 6, 1944.

- M5 Pulse generator for electronic rotor for the scanning submarine system. Norman B. Saunders. [HUSL.] August 29, 1944.
- M6 A new design for the vacuum tube electronic rotor. Roderic M. Scott. [HUSL.] October 2, 1944.
- M7 New electronic rotors. Stanley R. Rich. [HUSL.] October 14, 1944.
- M8 Varistors as reactance elements. Stanley R. Rich. [HUSL.] November 10, 1944.
- M9 Recommended change in pro-submarine rotor design. Stanley R. Rich. [HUSL.] November 29, 1944.
- M10 Ideal switching wave form. Stanley R. Rich. [HUSL.] December 8, 1944.
- M11 Plus or minus switching in ER sonar. Gerald I. Harrison. [HUSL.] December 23, 1944.
- M12 Varistor rotor troubles. Stanley R. Rich. [HUSL.] February 12, 1945.
- M13 The AX-89, No. 2, varistor rotor tests. Stanley R. Rich and Marjorie S. McKittrick. [HUSL.] February 14, 1945.
- M14 Pattern amplitude uniformity in ER sonar rotor, No. 1. Robert L. Cummerow and David C. Whitmarsh. [HUSL.] March 30, 1945.
- M15 Meeting at Federal Telephone and Radio Corporation on special purpose multielement tubes. Robert L. Cummerow. [HUSL.] May 17, 1945.
- M16 Scanning sonar. Inductive commutators. O. Hugo Schuck. [HUSL.] June 15, 1945.

633 Searchlight Sonar Systems

633.1 Anchored Vessel Screening (AVS)

- M1 Sonar, Type SR, for protection of capital ships at anchor. Roderic M. Scott. [HUSL.] November 22, 1942.
- M2 Anchored vessel screening. (Report No. D44/R296.) William H. Fritz. NLL. April 23, 1943.

633.11 Mark I, Anchor (HUSL)

- M1 Work on Project Anchor. O. Hugo Schuck. [HUSL.] December 15, 1942.
- M2 Mark I, Anchor, Description and results of J. Lewis Hathaway. [HUSL.] February 23, 1943.
- M3 Magnetostriction Anchor transducer. Lyman N. Miller. [HUSL.] March 12, 1943.
- M4 Conference on Anchor. O. Hugo Schuck. [HUSL.] May 14, 1943.
- M5 Project Anchor status report. J. Lewis Hathaway. [HUSL.] May 17, 1943.
- M6 Recommendations for anchored vessel screening, Anchor system. Nat H. Godbold. [HUSL.] July 12, 1943.
- M7 Anchored vessel screening. (n.a.) OEMsr-287; Section No. 6.1-sr287-2057. HUSL. May 5, 1945.

633.12 Mark III (BTL)

- M1 Trip to Bell Telephone Laboratories. Useful cir-

- cuits in their echo-ranging Anchor Project. Stanley R. Rich. HUSL. June 22, 1943.
- M2** Anchored vessel screen, Mark III. (n.a.) OEMsr-346. BTL. June 26, 1945.
- 633.2 Small Object Detectors (SOD)**
- M1** Detection of anchored mines by echo ranging. Harold P. Knauss. HUSL. September 16, 1943.
- M2** Letter to Commander Rawson Bennett. Subject: Detection of small objects by means of underwater acoustic devices. E. H. Colpitts. Division 6. May 4, 1944.
- M3** Small object detector program. [John S. Coleman.] [Division 6.] [December 19, 1944.]
- M4** Results of initial tests to determine detectability of mine detection pings, January 17, 1945. (Report No. J-551.) John V. Ellson. NLL. January 29, 1945.
- M5** XQHA sonar tests. (Report No. M-339.) William H. Williams. NObs-2074. UCDWR. July 30, 1945.
- M6** Some measurements of the directivity patterns, target strengths, and directivity factors of spheres, discs, triplanes and polyplanes. C. J. Burbank and Raymond C. Fisher. UCDWR. August 2, 1945.
- 633.21 Mine and Torpedo Detection Equipment (MATD)**
- M1** Small object location, Summary of preliminary tests on (USL Report No. 2.) William F. Arndt, J. Warren Horton and Fred T. Schell. NLL. March 15, 1945.
- M2** Mine and torpedo detection equipment. (Report No. P66/R1436.) J. Warren Horton. OEMsr-1128; Section No. 6.1-sr1128-2220. NLL. May 28, 1945.
- 633.22 UCDWR Models**
- M1** Measurements on crystal transducer JB4Z-1, No. 2191. (Report No. C-71.) (n.a.) Service Project No. NS-297. UCDWR. January 6, 1945.
- M2** Small object detector, SOD. (Report No. M-343.) Melvin E. Chun and C. E. Mongan. NObs-2074. UCDWR. July 17, 1945.
- 633.23 Underwater Sound Detection and Ranging Equipment (USDAR)**
- M1** Tests of Radio Corporation of America USDAR at Fort Pierce, Florida, on November 16 and 17, 1944. Wallace Waterfall. Division 6. November 25, 1944.
- M2** Letter to Captain C. Gulbranson. Subject: Supersonic underwater mine detector, also known as Torch, USDAR. E. H. Colpitts. Division 6. February 6, 1945.
- M3** Underwater sound direction and range system, USDAR. (n.a.) OEMsr-1347; Service Project No. NS-297; OSRD No. 5315; Section No. 6.1-sr1347-2331. RCA. June 30, 1945.
- 633.24 British Models**
- M1** Echo detection of small targets. (Internal Report No. 145.) H. F. Willis, D. W. Boston and others. OSRD Liaison Office No. WA-1154-16. HMA/SEE, Fairlie Laboratory [Great Britain]. September 23, 1943.
- M2** British Asdic, Type 135 tests. (Report No. SM-221.) Melvin E. Chun. OEMsr-30; Service Project No. NS-142. UCDWR. June 19, 1944.
- M3** Measurement on Type 150 Asdic magnetostriction transducer. (Report No. C-84.) (n.a.) NObs-2074. Service Project No. NS-139. UCDWR. May 1, 1946.
- 633.3 The 692 Submarine Sonar**
- M1** [Sonar system] 692, submarine sonar. (n.a.) OEMsr-692; OSRD No. 6633; Section No. 6.1-sr692-2396. BTL. February 28, 1946.
- 634 Echo-Sounding Equipment**
- 634.1 Silent Fathometer**
- M1** A study of the echo repeater and acoustic proximity fuze. Raymond C. Fisher. UCDWR. October 2, 1942.
- M2** Theory of echo repeater and regenerative object locator. Edwin M. McMillan. OEMsr-30; OSRD No. 1064; Section No. C4-sr30-626. UCDWR. November 3, 1942.
- M3** Silent fathometer. (Report No. SM-98.) George W. Downs, Jr. UCDWR. August 28, 1943.
- M4** Silent fathometers, General discussion on Harry Nyquist. Section No. 6.1-NDRC-123. Division 6. October 20, 1943.
- 634.2 Secure Echo Sound Equipment (SESE)**
- M1** Masking effect of water noise on short pulses. (Report No. S-239.) Raymond C. Fisher. OEMsr-30; Service Project No. NS-221; Section No. 6.1-sr30-1538. UCDWR. July 25, 1944.
- M2** Sea tests of overhearing of the secure echo-sounding equipment, SESE Model 2-I, aboard the submarine *SS41, Spadefish*. (Report No. SM-251.) David H. Ransom and Raymond C. Fisher. OEMsr-30; Service Project No. NS-221; Section No. 6.1-sr30-1843. UCDWR. August 22, 1944.
- M3** Secure echo-sounding equipment. (Report No. S-257.) David H. Ransom. OEMsr-30; Service Project No. NS-221; Section No. 6.1-sr30-1756. UCDWR. September 15, 1944.
- M4** Measurements on crystal transducer [Type] GD-16. (Report No. C-74.) (n.a.) OEMsr-30; Service Project No. NS-139. UCDWR. February 12, 1945.
- 635 Frequency Modulation Sonar**
- 635.1 Frequency Modulation Theory**
- M1** Frequency modulation. Saw-tooth modulation equivalent to succession of single frequency tran-

sients with rounded envelopes. (Report No. 210-KWP-MS.) Kenneth W. Pflugler. [Division 6.] Revised: March 19, 1942.

M2 Observations of echo signals obtained using variable frequency transmission. Edwin M. McMillan. [UCDWR.] July 4, 1942.

M3 Frequency modulation in echo ranging. Carl F. Eckart. OEMsr-30; Section No. C4-sr30-236. UCDWR. July 21, 1942.

M4 Coherence and fluctuation of frequency modulation reverberation. (Report No. M-395.) W. M. Rayton and M. J. Sheehy. NObs-2074. UCDWR. February 14, 1946.

635.11 Scanning

M1 Submarine detection as a problem in scanning. Alan M. Thorndike. [UCDWR.] October 22, 1941.

M2 Echoscope scanning. Frank C. Jones. [UCDWR.] January 14, 1942.

M3 Some considerations which concern the choice of optimum values of the echoscope design constants. Hubert P. Yockey. [UCDWR.] January 29, 1942.

635.12 Doppler Effect

M1 Doppler effect and echoscope. Alan M. Thorndike. [UCDWR.] October 17, 1941.

M2 The doppler effect on the echoscope. Darol K. Froman. UCDWR. March 24, 1942.

M3 The doppler effect on the Mason prism echoscope. Darol K. Froman. OEMsr-30; Section No. C4-sr30-222. UCDWR. June 16, 1942.

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M1 A proposal for improving the ratio of signal to reverberation in the echoscope. Raymond C. Fisher. UCDWR. June 12, 1942.

M2 The influence of thermal conditions on the transmission of 24-kc sound. [Part] II, Summary of transmission to a shallow hydrophone in deep water. (Report No. U-394.) M. J. Sheehy. NObs-2074. UCDWR. April 1, 1946.

635.14 Depth of Focus

M1 A suggestion for increasing the depth of focus of the echoscope. F. N. D. Kurie. [UCDWR.] March 9, 1942.

635.2 Developmental Systems

M1 Frequency modulation echo-ranging systems. Cobar, pribar and subsight. (Report No. U-12.)

Malcolm C. Henderson. OEMsr-30; Section No. 6.1-sr30-408. UCDWR. December 30, 1942.

M2 Notes on the operational requirements of frequency modulation echo-ranging detection systems. John N. A. Hawkins. UCDWR. [March 26, 1943.]

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M1 Supersonic echoscope development. Karl S. Van Dyke. [UCDWR.] August 18, 1941.

M2 Description of the echoscope. David C. Kalbfell. [UCDWR.] September 18, 1941.

M3 Some basic calculations on echoscope. Karl S. Van Dyke. OEMsr-30; Section No. C4-sr30-016. UCDWR. October 1, 1941.

M4 The echoscope development. Karl S. Van Dyke. OEMsr-30; Section No. C4-sr30-029. UCDWR. November 5, 1941.

M5 [The] echoscope. John N. A. Hawkins. [UCDWR.] December 2, 1941.

M6 The characteristics of certain echoscope systems. David C. Kalbfell. [UCDWR.] December 30, 1941.

M7 A new echoscope receiving system. Frank C. Jones. [UCDWR.] January 28, 1942.

M8 Measurements with the echoscope. Malcolm C. Henderson. [UCDWR.] May 30, 1942.

M9 Frequency modulation echo-ranging system. Echo-scope principle. John N. A. Hawkins, Malcolm C. Henderson and Charles G. McProud. OEMsr-30; Section No. 6.1-sr30-666. [UCDWR.] December 28, 1942.

635.211 Sine Sweep Echoscope

M1 An analysis of the sine sweep echoscope. Louis D. Statham. [UCDWR.] December 5, 1941.

M2 Comments on a memorandum by Louis D. Statham of December 5, 1941 on: The sine sweep echoscope. Henry E. Hartig. [UCDWR.] December 11, 1941.

635.212 Supersonic Prism

M1 [A] supersonic prism, The principle of operation, the design and the measurements made on a model of (n.a.) OEMsr-54; Section No. C4-sr54-051. BTL. December 20, 1941.

635.213 Frequency Modulation in Echoscope

M1 Note on frequency modulation as applied to the echoscope. David C. Kalbfell. [UCDWR.] September 24, 1941.

M2 Use of frequency modulation in echoscope. Alan M. Thorndike. [UCDWR.] October 25, 1941.

M3 Some notes on the peculiar behaviour of frequency-modulated continuous transmission echo-ranging systems. Karl S. Van Dyke. [UCDWR.] January 15, 1942.

M4 Study of two methods for improving the constancy of beat frequency in the echoscope. Raymond G. Fisher. UCDWR. June 11, 1942.

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635.22 Cobar

- M1** Tentative equipment specifications [for] auto-train gear. John N. A. Hawkins. [UCDWR.] July 9, 1942.
- M2** The cobar, or echoscope. Principles and practice. Charles G. McProud. [UCDWR.] September 15, 1942.
- M3** Sea tests of cobar (echoscope) with submarine [on] Friday, October 9, 1942. Malcolm C. Henderson. [UCDWR.] October 14, 1942.
- M4** Preliminary test of stroboscope as a multichannel indicating device for the cobar. Raymond C. Fisher. [UCDWR.] February 10, 1943.
- M5** Mine detection with cobar devices. (Report No. M-115.) Malcolm C. Henderson and A. H. Roshon. OEMsr-30. UCDWR. August 2, 1943.

635.23 Subsight

- M1** [The] subsight. (Report No. U-12a.) Malcolm C. Henderson. OEMsr-30; Section No. 6.1-sr30-415. UCDWR. February 20, 1943.
- M2** A proposed arrangement of subsight. (Report No. D14/R191.) J. Warren Horton. NLL. March 3, 1943.
- M3** Airplane location with subsight. (Report No. M-65.) Charles G. McProud. Service Project No. NS-142. UCDWR. May 29, 1943.
- M4** Mine location with subsight. (Report No. D41/R495.) Frederick C. Reed, Jr. and Richard G. Stephenson. NLL. August 23, 1943.

635.24 Frequency Modulation Sonar Systems

- M1** Multistring light valve. An alternative form of analyzer for frequency modulation sonar by the Western Electric Company, Inc. (Report No. U-276.) (n.a.) OEMsr-30; Section No. 6.1-sr30-1877. UCDWR. November 25, 1944.

635.241 Fampas

- M1** Outline of the proposed Fampas system. (Report No. M-30.) Charles A. Hisserich. UCDWR. January 25, 1943.
- M2** A multichannel electronic switch. (Report No. U-29.) Sidney Bertram. OEMsr-30; Service Project No. NS-142. UCDWR. March 1, 1943.
- M3** Frequency modulation sonar. (Report No. U-95.) Malcolm C. Henderson and Charles A. Hisserich. OEMsr-30. UCDWR. September 4, 1943.

635.242 Model 1

- M1** Preliminary manual [for] frequency modulation sonar, Model 1. Installation and operation. (Report No. R-134.) (n.a.) OEMsr-30. UCDWR. December 1, 1943.
- M2** Preliminary instruction book for frequency modulation sonar, Model 1, No. 3. Installation, operation and maintenance. (Report No. R-208.) (n.a.) OEMsr-30; Service Project No. NS-143. UCDWR. April, 1944.

- M3** Preliminary instruction book [for] frequency modulation sonar, Model 1, No. 5. Operation and maintenance. (Report No. R-223.1.) (n.a.) OEMsr-30; Service Project No. NS-142. UCDWR. September 15, 1944.

- M4** Preliminary instruction book [for] frequency modulation sonar, Model 1, Nos. 6 [through] 10. Operation and maintenance. (Report No. R223-3.) (n.a.) NObs-2074; Service Project No. NS-142. UCDWR. Revised: January 1, 1945.

- M5** Preliminary instruction book [for] frequency modulation sonar, Model 1, Nos. 11 [through] 15. Operation and maintenance. (Report No. R-223.4.) (n.a.) NObs-2074. UCDWR. May 12, 1945.

635.3 QLA Equipment

- M1** Instruction book for QLA and QLA-1 sonar equipment. (Report No. NavShips 900,790.) (n.a.) NObs-2074. [UCDWR.] February 27, 1946.

635.4 Test and Training Equipment

- M1** Saw-tooth swept oscillator testing by means of mechanical echo simulation. Charles A. Hisserich. [UCDWR.] January 22, 1942.
- M2** Proposed system for the rapid frequency analysis of an audio spectrum. (Report No. M-84.) Sidney Bertram. UCDWR. July 16, 1943.
- M3** Operator's manual for underwater sound portable testing equipment, Model OAX, or sound gear monitor. (n.a.) HUSL. October 1, 1943.
- M4** [The] QLA sonar trainer. (n.a.) NObs-2074; Task No. 5, Problem No. 5-I. UCDWR. April 13, 1946.

635.5 Photographs of Frequency-Modulated Sonar Systems Equipment

- M1** Desiderata governing construction of selective echo determining equipment (echoscope) by Brush Development Company, October, 1941. (Blueprint Nos. 2 to 13. Photograph No. 1.) (n.a.) [UCDWR.] May 16, 1946.
- M2** Diagrams and photographs. Subject: Frequency modulation sonar system. Frequency modulation oscillators. (Diagram Nos. 15 to 18, 22 to 41, 45 and 48. Photograph Nos. 14, 19 to 21, 42 to 44, 46 and 47.) (n.a.) [UCDWR.] (n.d.)
- M3** Diagrams and photographs. Subject: Frequency modulation sonar systems. Driver amplifiers. (Diagram Nos. 49 to 54, 56, 59 and 62. Photograph Nos. 55, 57, 58, 60 and 61.) (n.a.) [UCDWR.] (n.d.)
- M4** Diagrams and photographs. Subject: Frequency modulation sonar systems. Receivers. (Diagram Nos. 63 to 71, 75, 79 and 82. Photograph Nos. 72 to 74, 76 to 78, 80 and 81.) (n.a.) [UCDWR.] (n.d.)
- M5** Diagrams and photographs. Subject: Frequency modulation sonar systems. Analyzers. (Diagrams Nos. 85, 90, 95, 96, 101, 104, 107, 110, 111, 113, 115 to 118, 121 to 127 and 129. Photograph Nos.

83, 84, 86 to 89, 91 to 94, 97 to 100, 102, 103, 105, 106, 108, 109, 112, 114, 119, 120, 128 and 130 to 132. (n.a.) [UCDWR.] (n.d.)

M6 Diagrams and photographs. Subject: Frequency modulation sonar systems. Indicators. (Diagram Nos. 133 to 135, 137, 141, 145 and 146. Photograph Nos. 136, 138 to 140 and 142 to 144.) (n.a.) [UCDWR.] (n.d.)

M7 Diagrams and photographs. Subject: Frequency modulation sonar systems. Associated devices. (Diagram Nos. 150 and 151. Photograph Nos. 147 to 149 and 152.) (n.a.) [UCDWR.] (n.d.)

640 Underwater Sound Instruments and Ordnance

641 Calibration Instruments

641.1 Sound Gear Monitor (OAX)

M1 QC monitor. O. Hugo Schuck and Isaac P. Rodman. OEMsr-287; Section No. 6.1-sr287-388. HUSL. January 12, 1943.

M2 Methods suitable for the calibration and use of an octave-band sound level meter. Part I, Calculation of sound levels from spectra. Part II, Calibration of an octave-band sound level meter. (Report No. M-32.) R. W. Young. UCDWR. February 10, 1943.

M3 QC driver tuning. Comparison of several methods. (Report No. P29/R474.) William F. Arndt. Service Project No. NS-142. NLL. August 11, 1943.

M4 Effect of measuring distance on directivity patterns and maximum intensity. Measurements on 19-inch QC projector 78099, No. 93-550L495. Patterns taken with sound gear monitor, projector tests gear, set up at different distances between projector head and hydrophone. Marvin J. Foral. HUSL. November 16, 1943.

M5 The monitor as a vacuum tube voltmeter. Instructions for adapting Model 5-C or 5-E sound gear monitor for use as a vacuum tube voltmeter. Charles E. Houston, Benjamin A. Wooten and Dwight E. Gray. OEMsr-287; Section No. 6.1-sr287-1708. HUSL. July 10, 1944.

M6 Driving data on B-19H at low frequency. Paul E. Sabine and Paul Ebaugh. [HUSL.] August 18, 1944.

M7 Characteristics of B-19B hydrophones from 10 to 40 kc. Paul E. Sabine. [HUSL.] August 30, 1944.

M8 Response of B-19B and B-19H hydrophones in a strong sound field. Charles R. Rutherford. [HUSL.] September 7, 1944.

M9 Sound gear monitor. Underwater sound portable test equipment. (n.a.) OEMsr-287; Section No. 6.1-sr287-2086. HUSL. November 1, 1945. pp. 106-107.

641.11 Installed Monitor

M1 Installed sound gear monitor, Recommendations on O. Hugo Schuck. [HUSL.] March 20, 1944.

641.12 Extended Range Monitor (OCP)

M1 Extended range monitor. Instructions for converting frequency range of sound gear monitor, Model 5C or 5E, underwater sound portable testing equipment, Model OAX, from 17 kc-26 kc to 17 kc-71 kc. Fred H. Smith. OEMsr-287; Section No. 6.1-sr287-1550. HUSL. May 20, 1944.

M2 Hydrophone specifications for X-OCP monitors. John R. Reitz. [HUSL.] December 18, 1944.

M3 Operator's manual for sonar portable testing equipment, Model X-OCP [a] wide range monitor. (n.a.) HUSL. March 1, 1945.

641.13 Split Projector Test Unit (SPTU)

M1 Split projector test unit. (n.a.) OEMsr-287; Section No. 6.1-sr287-2051. HUSL. December 1, 1944.

641.14 Projector Test Gear (PTG)

M1 Projector test gear. (n.a.) OEMsr-287; Section No. 6.1-sr287-2050. HUSL. December 1, 1944.

641.2 Dynamic Monitor

M1 Dynamic monitor. Roderic M. Scott. [HUSL.] December 20, 1943.

M2 Figure of merit of QH sonar, WEA-1 and QBF. Charles A. Ewaskio. [HUSL.] July 24, 1944.

M3 Dynamic monitor. Charles A. Ewaskio. [HUSL.] October 5, 1944.

M4 Operating instructions for dynamic monitor. (n.a.) HUSL. October 18, 1944.

M5 Figure of merit of QCL on *Galaxy*. Electrical noise level of QH Model II. ([Parts] I and II.) Charles A. Ewaskio. [HUSL.] November 13, 1944.

M6 The dynamic monitor. (n.a.) OEMsr-287; Section No. 6.1-sr287-2058. HUSL. April 10, 1945.

641.3 OAY Sound Measuring Equipment

M1 Calibration of OAY sound measuring equipment No. 1 and General Radio sound level meter, Type 759, Model OR-1, Serial Number 9. (Report No. G7/R478.) Wilbur T. Harris. NLL. August 12, 1943.

M2 Modification of OAY sound meter. Frank P. Herrnfeld. NLL. December 15, 1943.

M3 Modification of Type OAY sound measuring equipment. (Report No. D53/R714.) Frank P. Herrnfeld. NLL. March 30, 1944.

M4 Preliminary installation, operation and maintenance instructions for Model OAY sound measuring equipment. (n.a.) NLL. [June 26, 1944.]

M5 Methods for calculating correction factor for the RQ-51055 hydrophone. (Report No. D53/R1155.) William B. Snow. Service Project No. NS-212. NLL. October 21, 1944.

M6 Model OAY sound measuring equipment. (Report No. D53/R1249.) William B. Snow and Frank P. Herrnfeld. OEMsr-1128; Service Project No. NS-212; Section No. 6.1-sr1128-1922. NLL. May 3, 1945.

641.31 Noise Measurements

- M1** Auxiliary and underway tests on *USS Gabilan* (SS-252.) (Report No. D52/R866.) Donald P. Loye and Malcolm T. Rodger. Service Project No. NS-212. NLL. April 10, 1944.
- M2** Dockside noise measurements of new-construction submarines. (Report No. D53/R874.) Donald P. Loye, Robert A. Wagner and Robert W. Pratt. OEMsr-1128; Service Project No. NS-212; Section No. 6.1-sr1128-1572. NLL. May 10, 1944.
- M3** Manitowoc dockside auxiliary noise measurements [on the] *USS Hardhead* (SS-365.) (Report No. D53/R926.) Donald P. Loye and Robert A. Wagner. Service Project No. NS-212. NLL. May 13, 1944.
- M4** Submarine noise measurements at the Canal Zone, Pearl Harbor, Midway and Mare Island. (Report No. D53/R1034.) Donald P. Loye and Robert A. Wagner. NLL. July 18, 1944.
- M5** Overside noise measurements of submarines. (Report No. D53/R1068.) Donald P. Loye, Robert A. Wagner and Robert W. Pratt. OEMsr-1128; Service Project No. NS-212; Section No. 6.1-sr1128-1584. NLL. September 12, 1944.

642 Operational Aids**642.1 Noise Level Monitor and Cavitation Indicator**

- M1** Masking attachment for the noise level monitor. (Report No. P55/R1062.) William B. Snow. Service Project No. NS-113. NLL. August 10, 1944.
- M2** Noise level monitor meter circuit. (Report No. P55/1323.) Frank P. Herrnfeld. Service Project No. NS-113. NLL. January 22, 1945.
- M3** Noise level monitor and cavitation indicator. (Report No. P55/R1281.) William B. Snow. OEMsr-1128; Service Project No. NS-113; OSRD No. 4685; Section No. 6.1-sr1128-1930. NLL. January 31, 1945.

642.11 Tests and Performance

- M1** Cavitation speeds of fleet-type submarines. (Report No. P32/R876.) William B. Snow and Henry B. Hoff. NLL. April 19, 1944.
- M2** Comparative noise level monitor and standard range noise tests on *USS Besugo* (SS-321). (Report No. P55/R1052.) Robert A. Wagner. Service Project No. NS-113. NLL. July 31, 1944.
- M3** [The] JP-1 vs QB/JK for cavitation indication. (Report No. P55/R1115.) William B. Snow. Service Project No. NS-113. NLL. October 4, 1944.
- M4** Some tests of the cavitation indicator on the *USS Boarfish*. (Report No. P55/R1203.) Mark Harrison. Service Project No. NS-113. NLL. October 23, 1944.

642.2 Depth Charge Direction Indicator (DCDI)

- M1** Preliminary installation, operation and maintenance instructions for pre-production model of

depth charge direction indicator. (Report No. D50/R665A.) (n.a.) OEMsr-1128; Service Project No. NS-238; Section No. 6.1-sr1128-1240. NLL. January 25, 1944.

- M2** Water-tight cable entrance fitting for underwater service. (Report No. D50/R730.) Gaynor O. Rockwell. OEMsr-1128; Service Project No. NS-238; Section No. 6.1-sr1128-1036. NLL. February 24, 1944.
- M3** Permanent magnet blastphones. (Report No. D50/R930.) James W. Follin, Jr. NLL. May 15, 1944.
- M4** Depth charge direction indicator. (Report No. D50/R668.) Gaynor O. Rockwell. OEMsr-1128; Service Project No. NS-238; Section No. 6.1-sr1128-1251. NLL. October 31, 1944.

642.21 Tests and Performance

- M1** Effect of submarine roll on operation of depth charge indicator. (Report No. G12/R570.) James W. Follin, Jr. NLL. October 26, 1943.
- M2** Recommendation for range measurement for the depth charge direction indicator. (Report No. D50/R868.) James W. Follin, Jr. Service Project No. NS-238. NLL. April 28, 1944.
- M3** Effect of temperature gradients on the above-below indications of the depth charge indicator. (Report No. D55/R987.) (n.a.) NLL. July 4, 1944.
- M4** Effect of thermal gradient on depth charge direction indicator above-below indication. (Report No. D50/R1049.) Jordan J. Markham. Service Project No. NS-238. NLL. August 8, 1944.
- M5** Effect of temperature gradients on depth charge direction indicator above-below indications. (n.a.) NLL. November 25, 1944.

642.3 Depth Charge Range Estimator (DCRE)

- M1** Depth charge range meter, Model IV. (Report No. D50/R1252.) Sylvester J. Haefner. Service Project No. NS-238. NLL. November 24, 1944.
- M2** Depth charge range estimator. (Report No. D50/R1337.) William B. Snow, Gaynor O. Rockwell and James R. Ording. OEMsr-1128; Service Project No. NS-238; OSRD No. 5249; Section No. 6.1-sr1128-1948. NLL. May 21, 1945.

642.31 Tests and Performance

- M1** Depth charge range meter tests. (Report No. D50/R1222.) Henry B. Hoff, George R. Perry and others. Service Project No. NS-238. NLL. November 20, 1944.
- M2** Supplement to: Depth charge range meter tests, Report No. D50/R1222. (Report No. D50/R1285.) Gaynor O. Rockwell, Henry B. Hoff and James R. Ording. Service Project No. NS-238. NLL. December 16, 1944.
- M3** The influence of thermal gradients on relative sound intensities with special reference to the depth charge range estimator. (Report No. P28/1398.) George R. Perry. NLL. February 28, 1945.

- M4 Summary of sea trials of depth charge range estimator. (Report No. NP24/D50.) James R. Ording. NLL. July 4, 1945.
- 642.4 Acoustic Marine Speedometer (AMS)**
- M1 Marine speedometer. John D. Lane. [HUSL.] May 20, 1943.
- M2 Marine speedometer. Robert B. Watson. [HUSL.] May 21, 1943.
- M3 Marine speedometer. Fred. H. Smith. [HUSL.] May 25, 1943.
- M4 Acoustic marine speedometer. Robert B. Watson, Dwight E. Gray and M. Kathleen Ahern. OEMsr-287; Section No. 6.1-sr287-1541. HUSL. April 28, 1944.
- M5 Check of the reactance tube voltage of the own-doppler nullifier as a speed indicator. Allen A. Chernosky. [HUSL.] September 2, 1944.
- M6 Acoustic marine speedometer. (n.a.) OEMsr-287; Section No. 6.1-sr287-2074. HUSL. August 15, 1945.
- 642.41 Steady-State Acoustic Marine Speedometer (SAMS)**
- M1 Test of acoustic marine speedometer. Robert B. Watson. [HUSL.] December 21, 1942.
- M2 Test of acoustic marine speedometer. Robert B. Watson. [HUSL.] February 1, 1943.
- M3 Acoustic marine speedometer. Frederick V. Hunt. [HUSL.] February 4, 1943.
- M4 Acoustic marine speedometer. Robert B. Watson. [HUSL.] February 6, 1943.
- M5 Acoustic marine speedometer. Robert B. Watson. [HUSL.] February 10, 1943.
- M6 Acoustic marine speedometer. Frederick V. Hunt. [HUSL.] February 13, 1943.
- M7 Frequency measurement, Influence of uncertainty principle on measurement of Frederick V. Hunt. [HUSL.] August 13, 1943.
- M8 Dopplerized brainstorms. Frederick V. Hunt. [HUSL.] June 26, 1944.
- M9 Acoustic marine speedometer. Robert B. Watson. [HUSL.] June 30, 1944.
- 642.42 Acoustic Marine Pinging Speedometer (AMPS)**
- M1 Observations using the QC echo-ranging device aboard the *Galaxy*, May 4 to May 10 inclusive, 1942 in re: doppler, acoustic speedometer, reverberations, etc. Leon G. S. Wood. [HUSL.] March 15, 1943.
- M2 Measurements of reverberation frequency with QC equipment. Robert B. Watson. [HUSL.] July 23, 1943.
- M3 Measurements of reverberation frequency with QC equipment. Robert B. Watson. [HUSL.] July 29, 1943.
- M4 Analysis of the pinging speedometer problem. Robert B. Watson. [HUSL.] August 5, 1943.
- 642.43 Phase Acoustic Marine Speedometer (PAMS)**
- M1 Acoustic speedometer. New type using phase indication. Malcolm H. Hebb. [HUSL.] November 26, 1942.
- M2 Acoustic marine speedometer proposal. Harold P. Knauss. [HUSL.] January 26, 1943.
- M3 Acoustic phase speedometer. Malcolm H. Hebb. [HUSL.] April 28, 1943.
- M4 Acoustic marine phase speedometer. Robert B. Watson. [HUSL.] April 29, 1943.
- M5 Acoustic marine phase speedometer. Robert B. Watson. [HUSL.] December 9, 1943.
- 642.44 Transducers**
- M1 Probe microphone. Robert B. Watson. [HUSL.] February 17, 1943.
- M2 Probe microphone. Frederick V. Hunt. [HUSL.] February 23, 1943.
- M3 Reciprocity calibration of the 96-kc speedometer cone hydrophone. Robert E. Payne. [HUSL.] February 23, 1943.
- M4 Visit of Mr. Primakoff of the Underwater Sound Reference Laboratory. Robert B. Watson. [HUSL.] September 17, 1943.
- M5 Acoustic marine speedometer, Transducer for Robert B. Watson. [HUSL.] December 18, 1943.
- 643 Echo Repeaters**
- M1 Proposed sonic target. Lowell C. Gibson. [HUSL.] September 9, 1942.
- M2 Echo repeaters. (n.a.) OEMsr-287; Section No. 6.1-sr287-2070. HUSL. September 1, 1945.
- 643.1 Theoretical Discussion**
- 643.11 Electronic Design**
- M1 The echo repeater. Sonar question. Carl M. Herget. [HUSL.] February 25, 1943.
- M2 The fundamental electronic problem of the echo repeater. Roderic M. Scott. [HUSL.] July 13, 1943.
- M3 Echo repeaters. Frederick V. Hunt. [HUSL.] August 3, 1943.
- M4 Echo repeaters. Robert B. Watson. [HUSL.] August 4, 1943.
- M5 Clarification of the echo repeater problem. Roderic M. Scott. [HUSL.] August 6, 1943.
- M6 Echo repeater problem. Roderic M. Scott. [HUSL.] August 13, 1943.
- M7 [The] B-19F 15-inch tubular sonar echo repeater hydrophone. Francis P. Bundy. [HUSL.] September 6, 1943.
- M8 Echo repeater, Compression amplifier for Frederick V. Hunt. [HUSL.] October 12, 1943.
- M9 Echo repeaters with reference to F. V. Hunt's memorandum of October 12, concerning the application of automatic volume control. A. Nelson Butz, Jr. [HUSL.] October 19, 1943.
- 643.12 Mechanical Design**
- M1 Preliminary study of the stability of a towed underwater body with diving wing. (Report No.

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- G2/3418.) Calvin A. Gongwer. OEMsr-20; Section No. C4-sr20-240. NLL. August 26, 1942.
- M2** The shape of a flexible rope towing a submerged body. (Report No. M-5.) Glen D. Camp. UCDWR. November 30, 1942.
- M3** A streamlined cable depressor. (Report No. M-68.) Albert R. Champion. UCDWR. May 25, 1943.
- M4** Safety devices for towed targets. Leon G. S. Wood. [HUSL.] May 29, 1944.
- M5** Echo repeater design. Ralph D. Whitmore. [HUSL.] September 22, 1944.
- M6** Equations of depth, cable resistance, etc. of towed underwater body and depressor. W. Starling Burgess. [HUSL.] September 28, 1944.
- 643.2 Types**
- 643.21 Triplane**
- M1** Towable targets. Carl M. Herget. [HUSL.] November 2, 1942.
- M2** The triplane. (Report No. U-4.) Donald E. Ross and F. N. D. Kurie. OEMsr-30; Section No. C4-sr30-402. UCDWR. November 23, 1942.
- M3** Supplement to: The triplane. (Report No. U-4a.) Donald E. Ross and F. N. D. Kurie. UCDWR. June 29, 1943.
- M4** Triplane echo repeaters. Fred H. Smith. [HUSL.] August 16, 1943.
- M5** Preliminary triplane tests. (Report No. G37/A24A/R577.) William Fred Arndt. NLL. October 28, 1943.
- M6** Modifications of the triplane target. (Report No. G37/R884.) A. Kenneth Tatum and Vernon M. Setterholm. NLL. April 20, 1944.
- 643.22 Smecho**
- M1** Smecho. Frederick V. Hunt. [HUSL.] June 12, 1943.
- M2** Cross talk reducer for Smecho. Harold P. Knauss and Claude W. Horton. [HUSL.] June 18, 1943.
- M3** Present state of Smecho towing. Carl M. Herget, Kenyon L. Zapf and Claude W. Horton. [HUSL.] June 28, 1943.
- 643.23 Model II (Gas Pipe)**
- M1** First sea test of the self-contained echo repeater, Model II. Edward R. Myrbeck. [HUSL.] April 20, 1945.
- M2** The calibration of the low-frequency self-contained echo repeater, Model II. Edward R. Myrbeck. [HUSL.] May 1, 1945.
- 643.24 Whale**
- M1** Project Whale. Isaac P. Rodman. [HUSL.] April 21, 1944.
- M2** The construction and performance of the Whale transducer. Milton R. Carlson and Francis P. Bundy. [HUSL.] July 16, 1944.
- M3** Instructions for Whale echo repeater. (n.a.) [HUSL.] August 1, 1944.
- M4** The calibration of the Whale echo repeater. Leon G. S. Wood. [HUSL.] August 12, 1944.
- M5** Sea test on Whale echo repeater. Robert H. Hughs. [HUSL.] August 14, 1944.
- 643.25 60-kc Echo Repeater**
- M1** Log of the trip to Fort Lauderdale, June 5 to June 15 [1944]. Experiences with the 60-kc Harvard echo repeater. Leon G. S. Wood. [HUSL.] June 23, 1944.
- M2** [Some] 60-kc repeaters. Isaac P. Rodman. [HUSL.] July 10, 1944.
- M3** The calibration of the 60-kc repeater on the *Questor*. Robert H. Hughes. [HUSL.] August 17, 1944.
- M4** Influence of transducer on howl point in echo repeaters. Malcolm H. Hebb. [HUSL.] September 6, 1944.
- 643.26 Artificial Echo Repeater**
- M1** Artificial echo repeater. (Report No. G29/R355.) Russell O. Hanson and Frank P. Herrnfeld. NLL. May 24, 1943.
- 643.27 Experimental Surface Model**
- M1** Experimental surface model echo repeater. William A. Myers and Edwin M. McMillan. UCDWR. June 20, 1942.
- 643.3 Performance Characteristics of Echo Repeater**
- M1** Echo repeater developed by NDRC Laboratory at San Diego, California. A. Nelson Butz, Jr. [HUSL.] September 29, 1942.
- M2** Echo repeater experiments with a submarine at San Diego. Robert B. Bowersox. [HUSL.] February 11, 1943.
- M3** Trials and tribulations of rotoscope and echo repeater. Harold P. Knauss and Carl M. Herget. [HUSL.] April 10, 1943.
- M4** The effect of bottom reflections on echo repeaters. Harold P. Knauss. [HUSL.] October 2, 1943.
- M5** Preliminary analysis of hit performance on echo repeater runs. Richard H. Bolt and W. H. Wilson. Service Project No. NO-181. Division 6. May 28, 1945.
- 643.4 Calibrators**
- M1** Echo repeater calibrators. Isaac P. Rodman. [HUSL.] July 22, 1944.
- M2** Notations concerning echo repeater calibration gear. Edward R. Myrbeck. [HUSL.] September 30, 1944.
- M3** Proposal for method of measuring the signal reflecting strength of a submarine. Isaac P. Rodman. [HUSL.] October 9, 1944.
- M4** Target strength determination with the echo repeater calibrator. Frederick V. Hunt. [HUSL.] November 21, 1944.

- M5** Echo repeater calibrator. (n.a.) OEMsr-287; Section No. 6.1-sr287-2068. HUSL. August 1, 1945.
- 643.5 Dopplerizers**
- M1** Dopplerizers. Arthur H. Waynick and M. Kathleen Ahern. OEMsr-287; Section No. 6.1-sr287-1703. HUSL. July 1, 1944.
- 644 Attack Aids**
- M1** Recorder and predictor. (Report No. P9/1422.) Frank C. Gilbert. NLL. October 16, 1941.
- M2** Plotters and directors. O. Hugo Schuck. [HUSL.] January 21, 1943.
- M3** Asdic attacks. Part II, Attack instruments. (Internal Report No. 83.) W. E. Dawson. OSRD Liason Office No. WA-897-23. HMA/SEE, Fairlie Laboratory [Great Britain]. June 30, 1943.
- M4** Attack aid. Marriage of attack plotter and attack director. O. Hugo Schuck. [HUSL.] July 20, 1944.
- 644.1 Attack Plotters**
- 644.11 Dead-Reckoning Tracer Modifications**
- M1** Description of a proposed optical dead-reckoning tracer table. Firth Pierce. UCDWR. January 24, 1944.
- M2** Automatic target positioner for the dead-reckoning tracer. Henry E. Hartig and Firth Pierce. Service Project No. NS-329. UCDWR. December 4, 1944.
- M3** The automatic target positioner for the dead-reckoning tracer, Model 1. (Report No. U-353.) (n.a.) NObs-2074. UCDWR. September 20, 1945.
- 644.12 Antisubmarine Attack Plotters (ASAP) — General Electric**
- M1** Antisubmarine attack plotter. Kenneth H. Kingdon and H. C. Pollock. OEMsr-323; Section No. C4-sr323-621. GE. November 18, 1942.
- M2** Course plotter using light beam instead of cathode-ray tube. W. K. Kearney. OEMsr-323; Section No. 6.1-sr323-1203. GE. September 3, 1943.
- M3** Installation, operation and maintenance of the attack plotter, Mark I, Model 2. (n.a.) CUDWR. [January 3] 1944.
- 644.13 Mechanical Geographical Attack Plotter (MGAP)**
- M1** Plotting devices. O. Hugo Schuck. [HUSL.] August 7, 1942.
- M2** Geographical plotter design considerations. O. Hugo Schuck. [HUSL.] January 13, 1943.
- M3** Course plotter. Methods of marking plotting surface. Lincoln K. Davis. [HUSL.] April 7, 1943.
- M4** Inspection of odegraph plotter. Fred H. Smith. [HUSL.] April 26, 1943.
- M5** The dynamic characteristics of the automatic target training gate as they affect the plotter. Fred H. Smith. [HUSL.] August 27, 1943.
- M6** Mechanical geographic attack plotter. (n.a.) OEMsr-287; Section No. 6.1-sr287-2061. HUSL. January 15, 1945.
- 644.14 Path Integrator**
- M1** Path integrator. Elmer J. Wade. GE. December 14, 1944.
- 644.2 Attack Directors**
- M1** Attack directors. (Report No. D26/R1350.) Woodman Perine. OEMsr-1128; Service Project No. NO-142; Section No. 6.1-sr1128-1934. NLL. February 28, 1945.
- 644.21 Attack Director III and Related Developments**
- M1** Antisubmarine attack directors. (Report No. D26.2/3947.) W. C. Herring, Harold H. Baker and others. OEMsr-20; Section No. C4-sr20-345. NLL. October 5, 1942.
- M2** Cogitations and ruminations during trip. O. Hugo Schuck. [HUSL.] January 20, 1943.
- M3** Lead angle calculator for bearing recorder. O. Hugo Schuck. [HUSL.] January 20, 1943.
- M4** Theoretical principles involved in lead prediction. Harvey A. Brooks. [HUSL.] February 3, 1943.
- M5** Simplified bearing recorder lead angle calculator. O. Hugo Schuck. [HUSL.] February 10, 1943.
- M6** Sine potentiometers. H. R. Davidson. OEMsr-1131; Section No. 6.1-sr1131-1147. CUDWR. November 15, 1943.
- M7** Attack director, Mark III. Robert B. Watson. HUSL. February 17, 1944.
- M8** Proposed method of solving attack problem for forward-thrown weapons. Robert B. Watson. [HUSL.] February 22, 1944.
- M9** A mechanical attack director. Hugh E. Harlow. [HUSL.] February 22, 1944.
- M10** A synopsis of mechanical and electronic functions incorporated in indicating range recorder. CAN-55134, Serial 3438, as revised for operation with attack director [Mark] III. (n.a.) [HUSL.] May 8, 1944.
- M11** Attack director [Mark] III. A combination range keeper, depth compensator, own-ship motor compensator and range rate determination. Hugh E. Harlow. [HUSL.] May 25, 1944.
- M12** Slant range correction recorder. Hugh E. Harlow, Benjamin A. Wooten and Dwight E. Gray. OEMsr-287; Section No. 6.1-sr287-1707. [HUSL.] July 15, 1944.
- M13** Attack director [Mark] III and related developments. (n.a.) OEMsr-287; Section No. 6.1-sr287-2082. HUSL. September 1, 1945.
- M14** Attack director, Mark III. H. R. Davidson and Conyers Herring. OEMsr-1131; Section No. 6.1-sr1131-1890. CUDWR. September 17, 1945.
- M15** NDRC lead angle computer. (n.a.) OEMsr-1131;

OSRD No. 3201; Section No. 6.1-sr1131-1313.
CUDWR. (n.d.)

644.22 Attack Director B

- M1 Graphical triangle solver for antisubmarine attack prediction. Leonard I. Schiff. University of Pennsylvania. April 10, 1942.
- M2 Graphical attack predictor for forward thrower. Leonard I. Schiff. University of Pennsylvania. April 15, 1942.
- M3 Sonar attack plotter. Harold P. Knauss. [HUSL.] March 6, 1943.
- M4 Sonar attack plotter. Frederick V. Hunt. [HUSL.] March 16, 1943.
- M5 Aid for solving the attack course problem. William T. Bartholomew. [HUSL.] August 13, 1943.
- M6 Mathematical prediction of attack course. William T. Bartholomew. [HUSL.] December 1, 1943.
- M7 Attack director [Model] B. William T. Bartholomew. [HUSL.] February 28, 1944.
- M8 Attack aids for relative plot plan position indicators. William T. Bartholomew and Harold P. Knauss. [HUSL.] June 6, 1944.
- M9 Electro-mechanical attack director for QH sonar. William T. Bartholomew. [HUSL.] June 8, 1944.
- M10 An electro-mechanical solution for attack director [Model] B. William T. Bartholomew. [HUSL.] June 16, 1944.
- M11 Attack director [Model] B. (n.a.) OEMsr-287; Section No. 6.1-sr287-2071. HUSL. July 30, 1945.

644.23 Miscellaneous Attack Directors

- M1 An electrical triangle solver. (Report No. D26.2/4396.) Frank P. Herrnfeld. NLL. October 30, 1942.
- M2 The development and testing of antisubmarine attack director. (n.a.) ARF. March 31, 1943.
- M3 Wellings attack computer. (Report No. D26/R309.) J. Warren Horton. NLL. April 26, 1943.

645 Design and Measurements

- M1 A graphical chart for combining single frequency signals with continuous spectra. (Report No. P34/R860.) Henry B. Hoff. NLL. April 7, 1944.
- M2 Electronic design and measurements at the New London Laboratory. (Report No. P35/R1428.) Frank B. Herrnfeld and William B. Snow. OEMsr-1128; Section No. 6.1-sr1128-2217. NLL. May 28, 1945.
- M3 An introduction to amplitude modulation. Paul K. Hudson. NLL. (n.d.)

645.1 Electronic

645.11 Tube Characteristics

- M1 Receiving tube characteristics. (Report No. G21/R371.) Frank P. Herrnfeld. NLL. May 31, 1943.
- M2 The magnitude of tube noise in the sonic and

supersonic range. (Report No. G30/R454.) Roland G. Quest. NLL. July 27, 1943.

- M3 Conversion gain of various tubes operating as mixers. (Report No. P35/R980.) L. Eugene Chipman. Service Project No. NS-139. NLL. June 22, 1944.
- M4 Dynamic characteristics of pentodes and grid current effects in triodes and pentodes. (Report No. P35/R1179.) Sylvester J. Haefner and L. Eugene Chipman. NLL. October 23, 1944.

645.12 Amplifier Circuits

- M1 Cathode-coupled amplifiers. (Report No. 218.) (n.a.) NLL. June 9, 1942.
- M2 High-impedance preamplifier. (Report No. M-55.) David C. Kalbfell. UCDWR. April 29, 1943.
- M3 Elimination of electrical noise in sonic listening equipment. (Report No. D24/D38/R726.) Edwin E. Teal. Service Project No. NS-113. NLL. January 31, 1944.
- M4 Triode phase detectors. (Report No. P35/R1255.) Douglas E. Mode. NLL. November 24, 1944.

645.13 Filters

- M1 [A] resistance-capacitance band-pass filter. (Report No. 9, Series A-4.) (n.a.) MIT Research Project DIC-5985. MIT. June 10, 1943.
- M2 Chart computation methods for filters. (n.a.) BTL. September 10, 1943.
- M3 Filter design formulas and charts. (Part I. Report No. P35/R984.) Sylvester J. Haefner. NLL. July 11, 1944.

645.14 Coils and Cores

- M1 Data for the design of inductances wound on molybdenum permalloy cores. (Report No. M-37.) R. S. Gales. UCDWR. February 25, 1943.
- M2 Hipersil cores. (Report No. P35/R871.) Arthur S. Westneat. NLL. April 12, 1944.
- M3 Hipersil core characteristics. (Report No. P35/R1012.) Sylvester J. Haefner and Arthur S. Westneat. NLL. July 11, 1944.

645.15 Measurements

- M1 The direct measurement of impedance. O. Hugo Schuck and William A. Felsing. OEMsr-287; Section No. 6.1-sr287-891. HUSL. June 4, 1943.
- M2 An impedance bridge for the measurement of balanced and unbalanced to ground circuits. (Report No. G30/535.) Sylvester J. Haefner. NLL. September 30, 1943.
- M3 Gain measurements. (Report No. P35/R669.) Frank P. Herrnfeld. NLL. December 30, 1943.
- M4 Peak-reading vacuum tube voltmeter. (Report No. D50/R721.) Albert T. Reynolds. Service Project No. NS-238. NLL. February 1, 1944.
- M5 Distortion tests by intermodulation method. (Report No. P35/R712.) Frank P. Herrnfeld. Service Project No. NS-139. NLL. March 28, 1944.
- M6 Amplifier and bridge measurements. (Report No.

P35/R870.) Sylvester J. Haefner. Service Project No. NS-139. NLL. April 28, 1944.

- M7 Test procedure for audio transformers [with a range of] 35 to 16000 cps. (Report No. P34/R1022.) Frank P. Herrnfeld. Service Project No. NS-139. NLL. July 13, 1944.

645.2 Sound Recordings

- M1 Equalizer design. (Report No. P37/R1278.) Russell O. Hanson and William B. Watkins. NLL. January 8, 1945.
- M2 Lateral disc recording at the New London Laboratory. (Report No. P37/R1312.) Russell O. Hanson. NLL. January 24, 1945.
- M3 Sound recording at the New London Laboratory. (Report No. P37/R1365.) Russell O. Hanson. OEMsr-1128; OSRD No. 5248; Section No. 6.1-sr1128-1945. NLL. May 23, 1945.

645.3 Servo Systems

- M1 Attack director [Mark] III servos. Norman B. Saunders. [HUSL.] June 15, 1944.

645.31 Amplifiers

- M1 Servo. Resistance-capacitance notching filters. Norman B. Saunders. [HUSL.] January 4, 1944.
- M2 A graphical method for computing the transfer function of the modulation upon a carrier when the modulated carrier is passed through a filter whose transfer function is known. Norman B. Saunders. [HUSL.] May 9, 1944.
- M3 A new servo modulator for portable polar chart recorder, attack director [Mark] III and proportional training. Norman B. Saunders. [HUSL.] May 30, 1944.
- M4 Reducing the output impedance of power amplifiers with specific application to servos and the directional pattern tracer and portable polar chart recorder. Norman B. Saunders. [HUSL.] February 12, 1945.
- M5 Reducing the output impedance of power amplifiers with specific application to servos and the directional pattern tracer and portable polar chart recorder. (Correction.) Norman B. Saunders. [HUSL.] February 14, 1945.
- M6 A device for measuring the transfer function of the modulation for carrier-frequency servo systems. Norman B. Saunders. [HUSL.] February 21, 1945.

645.32 Motors

- M1 General properties of low-inertia motors. (Report No. X-63649.) (n.a.) BTL. February 16, 1943.
- M2 Performance curves of Brown two-phase motor in controlled-rectifier circuit. Mary O. Marquardt. [HUSL.] November 23, 1943.
- M3 Servo motor. Amplifier investigation. O. Hugo Schuck. [HUSL.] January 28, 1944.
- M4 Two-phase servo motor properties. Mary O. Marquardt and Norman B. Saunders. [HUSL.] May 18, 1944.

- M5 Servo motor power and voltage amplifiers. Mary O. Marquardt and Norman B. Saunders. [HUSL.] June 30, 1944.

645.33 Synchro Test Unit

- M1 Synchro test unit, Unit No. 4136. (Report No. A30/R1112.) Francis W. Petit. NLL. October 25, 1944.
- M2 Synchro system test unit. (Report No. P26/R1270.) Glenn D. Gillett and Wayne G. Shaffer. OEMsr-1128; Service Project No. NS-139; Section No. 6.1-sr1128-1926. NLL. January 17, 1945.

646 Ordnance Development

- M1 Sea trials [of] 7-40-M projectiles in combination with the chute and screw-type dispensers. (Report No. D29/R319.) George W. Martin. NLL. May 10, 1943.
- M2 [The] 7-40-M blimp tests, Lakehurst, N. J. (Report No. D29/D23/R327.) George M. Gourley. NLL. May 11, 1943.
- M3 Subcaliber practice projectile and subcaliber spigot unit for the Mark X projector. (Report No. D25/R1250.) Gaynor O. Rockwell. OEMsr-1128; Section No. 6.1-sr1128-1923. NLL. December 11, 1944.

646.1 Charges

646.11 Fast-Sinking Depth Charges

- M1 Effect of nose shape on the performance at entrance of model underwater projectiles. (Report No. D10/3075.) Leslie J. Hooper. NLL. June 10, 1942.
- M2 The use of spin in underwater projectiles. (Report No. D10/3099.) Leslie J. Hooper. OEMsr-20; Section No. C4-sr20-157. NLL. June 11, 1942.
- M3 Comments of the Royal Aircraft Establishment, October 16, 1942 on OSRD Report No. 737: Effect of nose shape on the performance at entrance of model underwater projectiles. (Report No. D10/R133.) Leslie J. Hooper. NLL. December 15, 1942.
- M4 Velocity characteristics of a 6-inch by 32-inch fast-sinking projectile. (Report No. D10/R508.) John F. Ripken. OEMsr-20; Section No. 6.1-sr20-1026. NLL. September 18, 1943.
- M5 Tests of Mark 12 depth charges [held at the] Mine Tank, Naval Ordnance Laboratory, Washington, D. C. (Report No. D10/R740.) Clifford P. Kittredge. NLL. April 4, 1944.
- M6 Fast-sinking depth charges. (Report No. D10/D29/R1351.) Clifford P. Kittredge. OEMsr-1128; Section No. 6.1-sr1128-1935. NLL. May 21, 1945.

646.12 Scatter Charges for Surface Vessels

- M1 Tests on antisubmarine scatter bomb clusters with live fuzes in inert bombs. (Report No. 17.) R. J. Tinkham, H. A. Leedy and T. C. Poulter. ARF. July 26, 1943.

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- M2** Laboratory tests on severing and strength of the steel-banding strap for the antisubmarine scatter bomb cluster. (Report No. 18.) R. J. Tinkham, H. A. Leedy and T. C. Poulter. ARF. July 28, 1943.
- M3** Antisubmarine scatter bomb horn tests. (Report No. 19.) Irwin Fieldhouse, H. A. Leedy and T. C. Poulter. ARF. July 29, 1943.
- M4** Submersion tests for watertightness of antisubmarine scatter bombs. (Report No. 20.) R. H. Esling, H. A. Leedy and T. C. Poulter. ARF. July 30, 1943.
- M5** The K-gun projected scatter bomb. (Report No. D49/R507.) Gaynor O. Rockwell and George M. Gourley. OEMsr-20; Section No. 6.1-S3279-1024. NLL. September 13, 1943.
- M6** Scatter charge for surface vessels. (Report No. D49/R644.) George M. Gourley and Gaynor O. Rockwell. OEMsr-20; Service Project No. NO-175; Section No. 6.1-sr1128-1248. NLL. December 13, 1943.
- M7** The scatter charge for surface vessels. (Report No. D49/R676.) Gaynor O. Rockwell and George M. Gourley. OEMsr-1128; Service Project No. NO-175; Section No. 6.1-sr1128-1252. NLL. February 2, 1944.
- M8** The antisubmarine scatter bomb. (n.a.) OEMsr-673; Section No. 6.1-sr673-1014. ARF. April 28, 1944.
- M9** Description and instructions for use of the antisubmarine scatter bomb. (n.a.) OEMsr-673; Section No. 6.1-sr673-1618. ARF. July 17, 1944.
- M10** Antisubmarine scatter bomb hydrostatic arming fuze. (n.a.) ARF. March 14, 1945.
- M11** The antisubmarine scatter bomb. (n.a.) OEMsr-673; Service Project No. NO-116; OSRD No. 5494; Section No. 6.1-sr673-2346. ARF. June, 1945.

646.2 Fire Control Components

646.21 Fuzes

- M1** A new type of bomb fuze. Raymond D. Atchley. UCDWR. June 13, 1942.
- M2** Safety tests made on Model 640-C fuzes and projectiles, Groton Quarry, June 13, 1942. (Report No. D10.2/4022.) George E. Breeze. NLL. September 18, 1942.
- M3** The 6-40-M magnetic flux-change fuze. (Report No. D37.2/4420.) Edward E. Noyes. NLL. November 4, 1942.
- M4** Comparison between Statham (US Navy Designation ABN-7A) fuze and New London 6-40-FCF fuze (6-40-M). (Report No. D37/R17.) Dick P. Fullerton, Jr. NLL. November 23, 1942.
- M5** The magnetic close-proximity fuze. (Report No. S-16.) S. C. Baden. OEMsr-30; Section No. 6.1-sr30-405. UCDWR. December 19, 1942.
- M6** Variable electronic interval timer. (Report No. D23/R132.) Wayne G. Shaffer. OEMsr-20; Section No. 6.1-sr20-557. NLL. December 23, 1942.

- M7** Projectile fuzes. (Report No. D10/R108.) George E. Breeze, George W. Martin and Edward E. Noyes. NLL. December 28, 1942.
- M8** The magnetic flux-change fuze. (Report No. S-11.) Louis D. Statham. OEMsr-30; OSRD No. 1332; Section No. 6.1-sr30-407. UCDWR. December 30, 1942.
- M9** Flux-change fuze for antisubmarine projectile. (n.a.) OEMsr-346; Section No. 6.1-sr346-726. BTL. February 25, 1943.
- M10** Special electric detonators for condenser firing circuits. (Report No. P17/R194.) Gaynor O. Rockwell. NLL. March 5, 1943.
- M11** Bridge-type magnetic fuze for antisubmarine projectile. (n.a.) OEMsr-346; Section No. 6.1-sr346-831. BTL. April 1, 1943.
- M12** Fuzes for fast-sinking depth charges. (Report No. P17/R1328.) Clifford P. Kittredge, George M. Gourley and George E. Breeze. OEMsr-1128; Section No. 6.1-sr1128-1940. NLL. May 24, 1945.

646.22 Intervalometers

- M1** Intervalometer. (Report No. D28/R383.) Clifford P. Kittredge. NLL. June 7, 1943.
- M2** Depth charge intervalometer. Description and instructions for use. (Preliminary Report No. D28/R981.) (n.a.) NLL. June 29, 1944.
- M3** Depth charge intervalometer. (Report No. D28/R1364.) Clifford P. Kittredge. OEMsr-1128; Section No. 6.1-sr1128-1939. NLL. May 17, 1945.

646.23 Dispensers and Racks

- M1** Notes on dispenser tests on *USS Semmes*, August 13, 1942. (Report No. D28.2/3702.) Leslie J. Hooper. NLL. September 3, 1942.
- M2** Electric squib-actuated bomb release latch. (Report No. D23/R135.) Gaynor O. Rockwell and Edward E. Noyes. NLL. December 23, 1942.
- M3** Projectile rack for blimps. (Report No. D23/R110.) Joseph A. Cerny. NLL. December 28, 1942.
- M4** Squib latch tests, January 21, 1943. (Report No. D23/R245.) George W. Martin. NLL. March 30, 1943.
- M5** Release latches actuated by electric squibs. (Report No. D28/R511.) Clifford P. Kittredge. NLL. September 15, 1943.
- M6** Mark 53 bomb rack for the Mark 52 antisubmarine bomb. (Report No. D23/R380.) Vernon M. Setterholm. OEMsr-20; Section No. 6.1-sr20-1029. NLL. September 29, 1943.
- M7** The roller loader for the scatter charge and the Mark 6 depth charge. (Report No. D49/R684.) Gaynor O. Rockwell. OEMsr-1128; Service Project No. NO-175; Section No. 6.1-sr1128-1037. NLL. February 11, 1944.
- M8** Surface craft dispensers for fast-sinking depth charges. (Report No. D28/R1363.) Clifford P. Kittredge. OEMsr-1128; Section No. 6.1-sr1128-1938. NLL. April 30, 1945.

646.24 Hydrostatically-Detonated Exploders

- M1** Letter to Dr. E. H. Colpitts. Subject: [Hydrostatically-detonated exploder.] (Serial No. C-2378 (940).) Roger Revelle. BuShips. February 18, 1944.
- M2** Sonar, submarines [and] long-range ship-to-shore communication. (Serial No. C-2908(940).) J. B. Dow. BuShips. June 19, 1944.
- M3** Letter to Dr. E. H. Colpitts. Subject: [Hydrostatically-detonated exploder.] (Serial No. C-3521 (940).) Roger Revelle. BuShips. September 14, 1944.
- M4** Specification for Model NL-143 detonating device. (Report No. P62/R1190.) (n.a.) NLL. October 21, 1944.
- M5** Hydrostatically-detonated exploder. (Report No. P62/R1358.) Gaynor O. Rockwell. OEMsr-1128; Section No. 6.1-sr1128-1937. NLL. March 6, 1945.

646.25 Fluid Gyroscopes

- M1** Description of the fluid gyroscope. (Report No. D42/R651.) Calvin A. Gongwer. Service Project No. NO-147. NLL. December 22, 1943.
- M2** Analysis of the fluid gyro. ([Division 7.]) Ralph E. Byrne, Jr. May 11, 1944.

646.26 Miscellaneous Fire Control Components

- M1** Gun train indicator, Mark 53, for temporary installation on projector, Mark 10, hedgehog. (Report No. D42/R200.) Clifford P. Kittredge. OEMsr-20; Section No. 6.1-sr20-799. NLL. September 10, 1943.
- M2** Range keeper. (Report No. D49/R505.) J. Warren Horton. OEMsr-20; Section No. 6.1-S3279-1025. NLL. September 14, 1943.

646.3 Sea Markers**646.31 Float Lights**

- M1** Electric ignition applied to Mark V aircraft float light. (Report No. D21/3364.) Joseph A. Cerny. OEMsr-20; Section No. C4-sr20-145. NLL. July 6, 1942.
- M2** The Mark V float light. (Report No. D21/4417.) Joseph A. Cerny and Dick P. Fullerton, Jr. OEMsr-20; Section No. C4-sr20-542. NLL. November 9, 1942.
- M3** Velocity traverses and stability tests of Mark V flare [at] Aeronautic Laboratory, Worcester Polytechnic Institute, March, 1943. (Report No. D21/R285.) Leslie J. Hooper. NLL. April 22, 1943.
- M4** Pneumatic projector for the Mark V float light for use by lighter-than-air craft. (Report No. D36/R183.) Joseph A. Cerny. OEMsr-20; Section No. 6.1-sr20-641. NLL. May 10, 1943.
- M5** Noise produced by burning aircraft flares. (Report No. D21/R463.) Edward Gerjuoy. NLL. July 31, 1943.
- M6** The smoke-light marker. (Report No. D21/R465.) Joseph A. Cerny. OEMsr-20; Service Project No.

NS-106; Section No. 6.1-sr20-797. NLL. August 26, 1943.

- M7** Pneumatic projector for the Mark V float light for use by heavier-than-air craft. (Report No. D39/R464.) Joseph A. Cerny. OEMsr-20; Section No. 6.1-sr20-796. NLL. September 3, 1943.
- M8** Drop tests of Mark VI aircraft float lights, December 7, 1943. (Report No. D21/R649.) David O. Rhea. NLL. December 15, 1943.
- M9** Modified Mark VI aircraft float light. (Report No. D21/R1088.) (n.a.) OEMsr-1128; Section No. 6.1-sr1128-1586. NLL. September 1, 1944.
- M10** Pull-match ignition for Mark VI float light. (Report No. D21/R1232.) David O. Rhea. OEMsr-1128; Service Project No. NS-106; Section No. 6.1-sr1128-1585. NLL. November 20, 1944.

646.32 Underwater Flares

- M1** Use of commercial flares under water. F. A. Jenkins. UCDWR. December 9, 1941.
- M2** Test of underwater flares [at] Lakehurst, N. J., July 7, 1942. Report on electric ignition. (Report No. D21/3423.) G. R. F. Gay. NLL. July 9, 1942.
- M3** Underwater flares for antisubmarine operations. Report on tests of July 7, 1942 carried out co-operatively by the US Naval Air Station, Lakehurst and Division B and Section C-4, NDRC. F. M. Varney. OEMsr-20; Section No. C4-sr20-162. UCDWR. July 20, 1942.
- M4** Aircraft marker flares. Test at Lakehurst, N. J., August 18, 1942. (Report No. D21.2/3802.) Joseph A. Cerny. NLL. August 22, 1942.
- M5** Capacity-type igniters for underwater flares. (Report No. D31.2/3998.) Wayne G. Shaffer. NLL. September 17, 1942.
- M6** Underwater flare test, September 30, 1942. (Report No. D31.2/4153.) Wayne G. Shaffer. NLL. October 6, 1942.
- M7** Trials of pneumatic flare gun for blimps at Lakehurst, N. J., December 22 and 23, 1942. (Report No. D36/R146.) Edward E. Noyes and Vernon M. Setterholm. OEMsr-20; Section No. 6.1-sr20-567. NLL. January 11, 1943.

646.33 Buoys

- M1** Smoke signal for practice submarine marker buoy. (Report No. D21/R719.) David O. Rhea and Vernon M. Setterholm. OEMsr-1128; Section Project No. NS-97; Section No. 6.1-sr1128-1039. NLL. March 24, 1944.
- M2** Test of British markers, marine [and] aircraft. (Report No. D21/R951.) David O. Rhea. Service Project No. NS-238. NLL. June 5, 1944.
- M3** Submarine marker buoy. (Report No. D19/R1205.) Calvin A. Gongwer. OEMsr-1128; Section No. 6.1-sr1128-1599. NLL. November 30, 1944.
- M4** The development of a navigational marker buoy. (n.a.) OEMsr-1244; OSRD No. 5658; Section No. 6.1-sr1224-2347. ARF. June, 1945.

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646.4 Miscellaneous Ordnance

- M1** Magnetic signal device. John H. Payne, Kenneth H. Kingdon and others. OEMsr-42; OSRD No. 917; Section No. C4-sr42-516. GE. August 11, 1942.
- M2** Towed projectile. (Report No. D27/R227.) Joseph A. Cerny. NLL. March 24, 1943.
- M3** Development of α_1 recoverable bomb. (Report No. D27/R1098.) (n.a.) OEMsr-1128; Service Project No. NA-123; Section No. 6.1-sr20-1587. NLL. October 25, 1944.

647 Sea-Water Batteries

- M1** Sea-water batteries. (n.a.) OEMsr-1069; OSRD No. 6420; Section No. 6.1-sr1069-2128. BTL. November 30, 1945.

650 Sonar Countermeasures**651 Noisemakers and Decoys**

- M1** Pillenwerfer design. (Internal Report No. 100.) (n.a.) OSRD Liaison Office No. WA-328-16. HMA/SEE, Fairlie Laboratory [Great Britain]. September 15, 1942.

651.1 Evaluation of Devices**651.11 Countermeasures to the Acoustic Torpedo**

- M1** Ship and decoy noisemaker measurements. (n.a.) OEMsr-1046; Service Project No. NS-164 and MIT Research Project DIC-6187; Section No. 6.1-sr1046-1040. MIT. October 2, 1943.
- M2** Ship and decoy noisemaker measurements. (Supplementary data.) (n.a.) Service Project No. NS-164 and MIT Research Project DIC-6187. MIT. November 12, 1943.
- M3** Countermeasures to the acoustic torpedo. (Memorandum No. 42.) (n.a.) US Navy Department, Antisubmarine Warfare Operations Research Group. November 20, 1943.
- M4** Acoustic measurements of ammonia-jet noisemakers (FXA), rotary noisemakers (NAE), parallel bars (FXR-IV), and *DD-155*. (n.a.) OEMsr-1046; Service Project No. NS-164 and MIT Research Project DIC-6187; Section No. 6.1-sr1046-1665. MIT. July 26, 1944.

651.12 Submarine Evasion Devices

- M1** Masking of submarine sounds by Mark II grenade and NAE beacon. [Lyman Spitzer, Jr.] CUDWR. January 24, 1945.
- M2** Sea trials of NAE beacon and Mark II grenades. (Report No. P27/PHR82.) Donald P. Loye. NLL. February 22, 1945.
- M3** The sound output of NAC beacons and Mark II grenade, signal peeper. (Memorandum No. SAG-41.) Edward Gerjuoy. CUDWR. July 12, 1945.
- M4** NAD, NAC and submarine spectrum curves. (Memorandum No. 5815.) Edward Gerjuoy. CUDWR. August 4, 1945.

- M5** Pro-submarine program at University of California, Division of War Research. General description of operations. Technical devices and programs. (n.a.) UCDWR. September 28, 1945.

651.2 Measurement Techniques of Noisemakers and Decoys

- M1** Transmission loss of underwater sound off Block Island. (n.a.) OEMsr-1046; Service Project No. NS-164; Section No. 6.1-sr1046-1058. MIT. May 11, 1944.
- M2** Oscillographic wave form records of underwater sounds. (n.a.) OEMsr-1046; Service Project No. NS-164 and MIT Research Project DIC-6187; Section No. 6.1-sr1046-1670. MIT. August 15, 1944.
- M3** The Massachusetts Institute of Technology oscillograph recorder. Design and operation. (n.a.) OEMsr-1046; Service Project No. NS-164 and MIT Research Project DIC-6187; Section No. 6.1-sr1046-1671. MIT. August 17, 1944.
- M4** Calibration facilities and techniques used at University of California, Division of War Research. David J. Evans. UCDWR. [August, 1946(?)]

651.3 Masking and Jamming Devices

- M1** Evasion device for submarines. (n.a.) Service Project No. NS-164 and MIT Research Project DIC-6187. MIT. August 10, 1943.
- M2** Displacements associated with noisemakers. R. D. Fay and Herman Feshbach. MIT Research Project DIC-6187. MIT. August 3, 1944.
- M3** Some exploratory developments in noisemaker design. (n.a.) OEMsr-1046; Service Project No. NS-164 and MIT Research Project DIC-6187; Section No. 6.1-sr1046-2037. MIT. April 30, 1945.

651.31 Mechanical Noisemakers**651.311 Towed Parallel Bars**

- M1** Preliminary investigations of the parallel pipe noisemaker and of its use as a sweep for acoustic mines. (Report No. PHx-24.) (n.a.) National Research Council, Division of Physics and Electrical Engineering [Canada]. October 8, 1941.
- M2** Results of FXR measurements made October 7, 1943. (n.a.) Service Project No. NS-164 and MIT Research Project DIC-6187. MIT. October 16, 1943.
- M3** Measurements of FXR sound output made November 2, 1943. (n.a.) Service Project No. NS-164 and MIT Research Project DIC-6187. MIT. November 12, 1943.
- M4** Measurements made on December 2, 1943 of the sound output of three sets of FXR-II gear. (n.a.) Service Project No. NS-164 and MIT Research Project DIC-6187. MIT. December 23, 1943.
- M5** Measurements made on December 14, 1943 of the sound output of the 22-inch FXR towed noisemaker and of the *DE-150*. (n.a.) Service Project No. NS-164 and MIT Research Project DIC-6187. MIT. January 5, 1944.

- M6** Measurements made on February 7, 1944 of the sound output of Canadian CAT gear and of the *DE-157*. (n.a.) Service Project No. NS-164 and MIT Research Project DIC-6187. MIT. February 14, 1944.
- M7** Measurements made on February 16, 1944 of the sound output of six FXR units and the towing vessel *DE-157*. (n.a.) Service Project No. NS-164 and MIT Research Project DIC-6187. MIT. March 2, 1944.
- M8** Measurements made on March 14 and 15, 1944 of the sound output of 30-inch and 28-inch parallel bar noisemakers and the towing vessel *DD-144*. (n.a.) OEMsr-1046; Service Project No. NS-164 and MIT Research Project DIC-6187; Section No. 6.1-sr1046-1472. MIT. April 8, 1944.
- M9** Measurements made on September 12 and 13, 1944 of the striking frequency of FXR Mark IV, and other experimental FXR models. (n.a.) MIT Research Project DIC-6187. MIT. September 26, 1944.
- M10** Acoustic trials of the American parallel bar noisemaker. (Report No. SS-1138.) (n.a.) OSRD Liaison Office No. WA-351-20. [Great Britain.] (n.d.)

651.312 FXP Towed Rotary Noisemakers

- M1** Comparison of sound outputs of *DE-150* and FXP-1 noisemaker. (n.a.) Service Project No. NS-164 and MIT Research Project DIC-6187. MIT. December 18, 1943.
- M2** Measurements of the sound output of the *DE-180* and FXP-1 noisemaker made on December 27 and December 28, 1943. (n.a.) Service Project No. NS-164 and MIT Research Project DIC-6187. MIT. December 31, 1943.
- M3** Measurements of the sound output of the *DE-180* and unbored FXP-1 noisemaker made on January 1, 1944. (n.a.) Service Project No. NS-164 and MIT Research Project DIC-6187. MIT. January 6, 1944.

651.313 NAE Rotary Noisemakers

- M1** Development of 3-inch rotary noisemaker for submerged submarine decoy. A. H. Brooks. MIT. June 9, 1944.
- M2** Calibration of David Taylor Model Basin rotary noisemaker, NAE beacon, Mark I. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1835. USRL. September 29, 1944.
- M3** Calibration of David Taylor Model Basin rotary noisemakers No. 1-ML and No. 2-ML, NAE beacon. L. P. Leighton. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1970. USRL. October 27, 1944.

651.314 XNAG Noisemakers

- M1** Calibration of pre-production sample Model 2, sonic companion to the NAC sound beacon. Genevieve D. Weldon. OEMsr-1130; Service Project

No. NS-139; Section No. 6.1-sr1130-1983. USRL. January 4, 1945.

- M2** Calibration of XNAG sound beacon. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2300. USRL. July 13, 1945.
- M3** Submarine evasive aid, Navy Model XNAG beacon. (n.a.) NObs-2074; Service Project No. NS-164. UCDWR. January 10, 1946.

651.315 Hammer Bottle Noisemakers

- M1** Tests on experimental models, pneumatic noisemaker XG-5, made on October 24, 1943. (n.a.) Service Project No. NS-164 and MIT Research Project DIC-6187. MIT. October 28, 1943.
- M2** Tests on masking effect of the XG-5 noisemaker on submarine sounds. (n.a.) Service Project No. NS-164 and MIT Research Project DIC-6187. MIT. November 12, 1943.
- M3** Measurements made February 8, 1944 on the acoustic output of FXH-1, the Massachusetts Institute of Technology carbon dioxide bottle. (n.a.) Service Project No. NS-164 and MIT Research Project DIC-6187. MIT. February 25, 1944.
- M4** Status of Mark I hammer bottle and rotary noisemaker. (n.a.) MIT Research Project DIC-6187. MIT. August 15, 1944.
- M5** Calibration of Massachusetts Institute of Technology 4-inch rotary noisemaker and hammer bottle noisemaker, Navy Model FXH-1. Leslie L. Foldy. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1830. USRL. September 18, 1944.
- M6** The FXH-1 hammer bottle expendable noisemaker. (n.a.) OEMsr-1046; Service Project No. NS-164 and MIT Research Project DIC-6187; Section No. 6.1-sr1046-2033. MIT. February 1, 1945.

651.32 Electronic Noisemakers

- M1** NAC beacon tests. (Report No. SM-215.) David J. Evans and Vaughn G. McKenney. OEMsr-30; Section No. 6.1-sr30-1685. UCDWR. May 19, 1944.
- M2** NAC beacon tests in 14th Naval district. (Report No. SM-240.) Vaughn G. McKenney and W. Bruce Beckley. Service Project No. NS-164. UCDWR. June 30, 1944.
- M3** The NAC beacon. (Report No. S-243.) Vaughn G. McKenney, Benjamin F. Howell and others. OEMsr-30; Service Project No. NS-164; Section No. 6.1-sr30-1746. UCDWR. August 15, 1944.
- M4** Calibration of NAC sound beacon. L. P. Leighton. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1973. USRL. November 17, 1944.
- M5** Description of NAC beacon. [Richard H. Bolt.] [Division 6.] [May, 1945.]

651.33 Explosive Noisemakers

- M1** Tests of four experimental models, grenade Mark I, made on October 15, 1943. (n.a.) Service Project No. NS-164 and MIT Research Project DIC-6187. MIT. October 18, 1943.

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- M2** Measurements of sound output of thirteen models, grenade Mark I, made on November 17, 1943. (n.a.) Service Project No. NS-164 and MIT Research Project DIC-6187. November 26, 1943.
- M3** Preliminary tests on masking effect of Mark II grenade on submarine sounds and tests on interference with echo ranging. (n.a.) Service Project No. NS-164 and MIT Research Project DIC-6187. MIT. December 4, 1943.
- M4** Measurements made on December 4, 1943 of the sound output of the noisemakers XG-2 and XG-5. (n.a.) Service Project No. NS-164 and MIT Research Project DIC-6187. MIT. December 22, 1943.
- M5** Tests of the US Navy grenade Mark II. (Report No. P27/PHR52.) J. E. White and William F. Arndt. NLL and MIT. December 11, 1944.
- M6** Explosive noise source in shallow water. (n.a.) MIT Research Project DIC-6187. MIT. December 22, 1944.
- M7** Calibrations of Massachusetts Institute of Technology Navy grenade noisemaker, Mark II and No. 6 Atlas blasting cap. Leslie L. Foldy. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1980. USRL. December 26, 1944.
- M8** The grenade Mark II explosive noisemaker. (n.a.) Service Project No. NS-164. MIT. March 19, 1945.
- M9** Calibration of Navy Bouchen fired Mark I grenade noisemaker. Leslie L. Foldy. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2304. USRL. August 2, 1945.
- M10** The Massachusetts Institute of Technology explosive noisemakers. (n.a.) OEMsr-1046; Service Project No. NS-164 and MIT Research Project DIC-6187; Section No. 6.1-sr1046-2038. MIT. August 15, 1945.
- M11** Calibration of noise output of modified British MD-1 caps. Leslie L. Foldy. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-2375. USRL. September 29, 1945.
- 651.34 Gas Ejection Noisemakers**
- M1** Measurements of the sound output of the Naval Research Laboratory ammonia-jet noisemaker FXA made on March 16, 17 and 18 [1944]. (n.a.) OEMsr-1046; Service Project No. NS-164 and MIT Research Project DIC-6187; Section No. 6.1-sr1046-1469. MIT. April 3, 1944.
- M2** Calibration of multiple-jet noisemaker, Navy Model FXA. Eginhard Dietze. OEMsr-1130; Service Project No. NS-139; Section No. 6.1-sr1130-1825. USRL. August 24, 1944.
- M3** An airjet high-frequency noise source. (Report No. P34/R1276.) Wilbur T. Harris. Service Project No. NS-182. NLL. December 7, 1944.
- 651.4 Submarine-Simulating Decoys**
- M1** Modifications and tests made on [the David] Taylor Model Basin self-propelled practice target. (Report No. M-225.) David J. Evans. OEMsr-30; Service Project No. NS-144; Section No. 6.1-sr30-1689. UCDWR. June 14, 1944.
- M2** Directional control devices by L. N. Schwein Engineering Company. (Report No. U-266.) (n.a.) OEMsr-30; Service Project No. NS-293; Section No. 6.1-sr30-1868. UCDWR. October 24, 1944.
- M3** Proposed design features for the new NAD-8 beacon. (Report No. SM-355.) Raymond D. Atchley. NObs-2074. UCDWR. August 27, 1945.
- M4** NAD-6 and NAD-10, Electronic design for C. F. Bradley. [UCDWR.] October 30, 1945.
- M5** The stationary echo repeater decoy for submarine use. (Report No. SM-396.) (n.a.) NObs-2074. UCDWR. February 28, 1946.
- M6** University of California, Division of War Research, activities on NAD sound beacon project at Submarine Base, Pearl Harbor. (Report No. SM-417.) David J. Evans. OEMsr-30. UCDWR. July 17, 1946.
- 651.41 NAD-3**
- M1** Submarine evasion aid, Navy Model NAD-3, sound beacon. (Report No. SU-364.) (n.a.) NObs-2074. UCDWR. April 10, 1946.
- 651.42 NAD-6**
- M1** Preliminary instruction manual [for] the NAD-6A sound beacon. (Report No. SM-332.) W. Orvis Johnston. NObs-2074. UCDWR. July 20, 1945.
- M2** The NAD-6 sound beacon. (n.a.) UCDWR. (n.d.)
- 651.43 NAD-10**
- M1** The NAD-10 sound beacon. D. E. Andrews. UCDWR. (n.d.)
- M2** The NAD-10A sound beacon preliminary instruction manual. (Report No. M-421.) Compiled by: D. E. Andrews. NObs-2074. UCDWR. October 1, 1946.
- 651.5 Depth Controls for Expendable Devices**
- M1** Buoyancy control. (Report No. M-135.) Raymond D. Atchley. OEMsr-30; Section No. 6.1-sr30-1302. UCDWR. December 3, 1943.
- M2** Buoyancy control. General instructions for use. (Report No. M-182.) Raymond D. Atchley. OEMsr-30; Section No. 6.1-sr30-1466. UCDWR. February 22, 1944.
- M3** A gas-operated depth control. (n.a.) OEMsr-1046; Service Project No. NS-164 and MIT Research Project DIC-6187; Section No. 6.1-sr1046-2040. MIT. August 15, 1945.
- 652 Acoustic Absorbing Coatings**
- M1** Measurements of specular reflection from scale models of submarines. (n.a.) Service Project No. NS-222 and MIT Research Project DIC-6187. MIT. February 12, 1944.
- M2** Acoustic treatment of conning towers. (n.a.) Service Project No. NS-222 and MIT Research Project DIC-6187. MIT. April 11, 1944.

- M3** Percentage reductions in maximum echo ranges on American submarines by acoustic treatment of hull and conning tower. Lyman Spitzer, Jr., N. Jeffrey Holter and Roger Revelle. BuShips and Division 6. November 30, 1944.
- M4** Acoustic treatment for conning towers. (n.a.) Service Project No. NS-222 and MIT Research Project DIC-6187. MIT. November 30, 1944.
- M5** Acoustical treatment for submarines. (n.a.) OEMsr-1046; Service Project No. NS-222 and MIT Research Project DIC-6187; Section No. 6.1-sr1046-2042. MIT. August 15, 1945.
- M6** Acoustical treatment for submarines. (Supplement.) (n.a.) OEMsr-1046; Service Project No. NS-222 and MIT Research Project DIC-6187; Section No. 6.1-sr1046-2042a. MIT. October 30, 1945.
- 653** **Miscellaneous Countermeasures**
- M1** A theoretical study of possible countermeasures to small contact depth charges. (n.a.) OEMsr-1046; Service Project No. NS-211 and MIT Research Project DIC-6187; Section No. 6.1-sr1046-2034. MIT. February 15, 1945.
- 700** **FLUID DYNAMICS**
- M1** Torpedo launching project report for [the] year ending November 30, 1944. (Report No. CIT/JHC-5.) F. C. Lindvall. OEMsr-418; OSRD No. 2346. CIT. February 1, 1945.
- 710** **Theory and Development**
- 711** **High Speed Water Tunnel (California Institute of Technology)**
- M1** The High Speed Water Tunnel at the California Institute of Technology. Robert T. Knapp, Vito A. Vanoni and James W. Daily. OEMsr-207. CIT. June 29, 1942.
- M2** Development of the High Speed Water Tunnel and summary of results. (n.a.) OEMsr-207; Section No. 6.1-sr207-2351. CIT. August 31, 1945.
- 712** **Cavitation and Sound**
- M1** Force and cavitation characteristics of the NACA-4412 hydrofoil. (HML Report No. ND-19.) Robert T. Knapp and James W. Daily. OEMsr-207; Section No. 6.1-sr207-1273. CIT. June 10, 1944.
- M2** Flow diagrams of projectile components. (HML Report No. ND-36.) Robert T. Knapp, Garrett Van Pelt and Elizabeth A. Thorne. OEMsr-207; Section No. 6.1-sr207-1649. CIT. September 15, 1944.
- M3** Entrance and cavitation bubbles. (HML Report No. ND-31.) Robert T. Knapp and Harold L. Doolittle. OEMsr-207; Section No. 6.1-sr207-1900. CIT. December 27, 1944.
- M4** Nose cavitation, ogives and spherogives. (HML Report No. ND-31.1.) Robert T. Knapp and Harold L. Doolittle. OEMsr-207; OSRD No. 4657; Section No. 6.1-sr207-1906. CIT. January 18, 1945.
- M5** Cavitation tests on a systematic series of torpedo heads. Hemispherical head. Hunter Rouse, John S. McNown and En-Yun Hsu. OEMsr-353; OSRD No. 5059; Section No. 6.1-sr353-2191. State University of Iowa. February 28, 1945.
- M6** Cavitation tests on a systematic series of torpedo heads. Blunt head. Hunter Rouse, John S. McNown and En-Yun Hsu. OEMsr-1353; OSRD No. 5056; Section No. 6.-sr1353-2192. State University of Iowa. March 5, 1945.
- M7** Cavitation noise from underwater projectiles. (HML Report No. ND-26.) Robert T. Knapp, James W. Daily and Howard Baller. OEMsr-207; Section No. 6.1-sr207-1910. CIT. March 20, 1945.
- M8** Cavitation tests on a systematic series of torpedo heads. [The] 1-caliber ogival head. Hunter Rouse, John S. McNown and En-Yun Hsu. OEMsr-1353; OSRD No. 5055; Section No. 6.1-sr1353-2195. State University of Iowa. March 20, 1945.
- M9** Cavitation tests on a systematic series of torpedo heads. [The] 2-caliber ogival head. Hunter Rouse, John S. McNown and En-Yun Hsu. OEMsr-1353; OSRD No. 5054; Section No. 6.1-sr1353-2196. State University of Iowa. March 26, 1945.
- M10** Hydrodynamic forces resulting from cavitation on underwater bodies. (HML Report No. ND-31.2.) Robert T. Knapp and James W. Daily. OEMsr-207; OSRD No. 5756; Section No. 6.1-sr207-2242. CIT. July 21, 1945.
- 713** **Miscellaneous Research**
- M1** Measurements of fluid friction loss in 0.50-caliber rifled and unrifled gun barrels. (HML Report No. ND-16.) Robert T. Knapp. OEMsr-207; Section No. 6.1-sr207-279. CIT. July 16, 1943.
- M2** Water Tunnel tests of the 60-mm mortar projectile. (HML Report No. ND-2C.) Robert T. Knapp. OEMsr-207; OSRD No. 1869; Section No. 6.1-sr207-926. CIT. September 2, 1943.
- M3** Measurements on a C11-A1 hydrophone with an ellipsoidal and a spherical reflector. (Report No. C-64.) (n.a.) OEMsr-30. UCDWR. October 30, 1944.
- 720** **Projectiles**
- 721** **Torpedoes**
- 721.1** **Projectile 61 and British Type Fido**
- M1** Preliminary Water Tunnel tests of the Fido projectile. (HML Report No. ND-8.) Robert T. Knapp. OEMsr-207. CIT. November 7, 1942.
- M2** Observations of cavitation on the Fido projectile. (HML Report No. ND-8.1.) Robert T. Knapp. CIT. November 24, 1942.
- M3** Underwater performance characteristics of Projectiles 61.01 and 61.03. (HML Report No. ND-8.4.) Robert T. Knapp and Joseph Levy. OEMsr-207; Section No. 6.1-sr207-1645. CIT. June 29, 1944.

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- M4** Underwater performance characteristics of Projectile 61.02. (HML Report No. ND-8.3.) Robert T. Knapp and Robert M. Peabody. OEMsr-207; Section No. 6.1-sr207-925. CIT. August 15, 1944.
- M5** Underwater characteristics of Projectile 61.04. (HML Report No. ND-8.5.) Robert T. Knapp and Robert M. Peabody. OEMsr-207; Section No. 6.1-sr207-1653. CIT. September 26, 1944.
- 721.2 Mark 13**
- M1** Water Tunnel tests of the Mark 13-1, Mark 13-2 and Mark 13-2A torpedoes. (HML Report No. ND-15.) Robert T. Knapp. OEMsr-207; OSRD No. 2060; Section No. 6.1-sr207-936. CIT. November 9, 1943.
- M2** Water Tunnel tests of the Mark 13-1, Mark 13-2 and Mark 13-2A torpedoes with shroud ring tails. (HML Report No. ND-15.1.) Robert T. Knapp and Joseph Levy. OEMsr-207; OSRD No. 3008; Section No. 6.1-sr207-939. CIT. November 24, 1943.
- M3** Water Tunnel tests of the Mark 13 torpedo with spade and stabilizer ring noses. (HML Report No. ND-15.2.) Robert T. Knapp and Harold L. Doolittle. OEMsr-207; Service Project No. NO-141; Section No. 6.1-sr207-1278. CIT. May 30, 1944.
- M4** Pressure distribution measurements on the Mark 13-1, 13-2 and 13-2A torpedoes. (HML Report No. ND-15.3.) Robert T. Knapp and Joseph Levy. OEMsr-207; OSRD No. 3935; Section No. 6.1-sr207-1643. CIT. June 23, 1944.
- M5** Underwater performance characteristics of the Mark 13-2A torpedo with suspension fittings. (HML Report No. [ND] 15.5.) Robert T. Knapp and Joseph Levy. OEMsr-207; OSRD No. 4096; Section No. 6.1-sr207-1650. CIT. August 18, 1944.
- M6** Pressure distribution on the Mark 13 series torpedoes with shroud ring tails. (HML Report No. ND-15.6.) Robert T. Knapp and Joseph Levy. OEMsr-207; Section No. 6.1-sr207-1905. CIT. January 15, 1945.
- M7** Tests of the Mark 13-1 torpedo with various noses. (HML Report No. [ND] 15.4.) Robert T. Knapp and Harold L. Doolittle. OEMsr-207; OSRD No. 4765; Section No. 6.1-sr207-1909. CIT. February 1, 1945.
- M8** Force tests of Mark 13-1 torpedo with suspension bands. (HML Report No. ND-15.7.) Robert T. Knapp and Gerald B. Robison. OEMsr-207; Section No. 6.1-sr207-2231. CIT. May 17, 1945.
- 721.3 Mark 14, 15 and 26**
- M1** Force and cavitation tests of the Mark 14-1 and Mark 15-1 torpedoes. (HML Report No. ND-18.) Robert T. Knapp and Joseph Levy. OEMsr-207; OSRD No. 5474; Section No. 6.1-sr207-2238. CIT. July 15, 1945.
- M2** Pressure distribution measurements on the Mark 14-1 and Mark 15-1 torpedoes. (HML Report No. ND-18.1.) Robert T. Knapp and Joseph Levy. OEMsr-207; OSRD No. 6092; Section No. 6.1-sr207-2244. CIT. August 15, 1945.
- M3** Force and cavitation tests of the Mark 26 torpedo. (HML Report No. ND-38.) Robert T. Knapp and Robert M. Peabody. OEMsr-207; OSRD No. 6423; Section No. 6.1-sr207-2249. CIT. August 31, 1945.
- 721.4 Mark 25**
- M1** Water Tunnel tests of the Mark 25 torpedo with gas exhaust through a vertical fin. (HML Report No. ND-30.) Robert T. Knapp and Harold L. Doolittle. OEMsr-207; Service Project No. NO-176; OSRD No. 3664; Section No. 6.1-sr207-1275. CIT. May 8, 1944.
- M2** Water Tunnel tests of the Mark 25 torpedo with [a] gas exhaust through a horizontal pipe. (HML Report No. ND-30.1.) Robert T. Knapp and Harold L. Doolittle. OEMsr-207; Section No. 6.1-sr207-1640. CIT. June 5, 1944.
- M3** Water Tunnel tests of the Mark 25 torpedo with expanding exhaust pipe. (HML Report No. ND-30.2.) Robert T. Knapp and Harold L. Doolittle. OEMsr-207; Section No. 6.1-sr207-1642. CIT. June 20, 1944.
- M4** [The] Mark 25 torpedo exhaust gas investigation. (HML Report No. ND-30.4.) Robert T. Knapp and Harold L. Doolittle. OEMsr-207; OSRD No. 5119; Section No. 6.1-sr207-1916. CIT. April 12, 1945.
- M5** [The] Mark 25 torpedo with various exhaust pipes. (HML Report No. ND-30.3.) Robert T. Knapp and Harold L. Doolittle. OEMsr-207; OSRD No. 5381; Section No. 6.1-sr207-2236. CIT. July 4, 1945.
- M6** Pressure distribution measurements on the Mark 25 torpedo. (HML Report No. ND-30.5.) Robert T. Knapp and Joseph Levy. OEMsr-207; OSRD No. 6313; Section No. 6.1-sr207-2248. CIT. August 31, 1945.
- 721.5 Squid (British Type C)**
- M1** Water Tunnel tests of the British Squid projectile, Type C. (HML Report No. ND-24.) Robert T. Knapp. OEMsr-207; Section No. 6.1-sr207-933. CIT. October 29, 1943.
- M2** Water Tunnel tests of the British Squid projectile, Type C, with two alternate flat noses. (HML Report No. ND-24.1.) Robert T. Knapp and Harold L. Doolittle. OEMsr-207; Section No. 6.1-sr207-938. CIT. November 29, 1943.
- M3** Drag tests of the British Squid. (HML Report No. ND-24.2.) Robert T. Knapp and Gerald B. Robison. OEMsr-207; Section No. 6.1-sr207-1904. CIT. January 8, 1945.
- M4** Force tests of the Squid with new afterbody, tails and noses. (HML Report No. ND-24.3.) Robert T. Knapp and Gerald B. Robison. OEMsr-207; OSRD No. 5529; Section No. 6.1-sr207-2243. CIT. July 30, 1945.

722 Rockets**722.1 2¼-Inch Antiaircraft Rocket**

M1 Water Tunnel tests of the 2¼-inch antiaircraft projectile. (Report No. ND-13.) Robert T. Knapp. CIT. May 14, 1943.

M2 Water Tunnel tests of the 2¼-inch antiaircraft rocket projectile. (HML Report No. ND-13.1.) Robert T. Knapp and James W. Daily. OEMsr-207; Section No. 6.1-sr207-927. CIT. December 28, 1943.

722.2 2.36-Inch Antitank Rocket

M1 Water Tunnel tests of the M-7, 2.36-inch antitank rocket showing comparison of performance with a folding fin tail, a shroud ring tail, two hemispherical ogive noses of different profile and a conical-pointed nose. (HML Report No. ND-11.3.) Robert T. Knapp. OEMsr-207; OSRD No. 3074; Section No. 6.1-sr207-276. CIT. June 26, 1943.

M2 Water Tunnel tests of the M-6, 2.36-inch antitank rocket showing comparison of performance with the conical-pointed nose combined with three types of shroud ring tail and with shroud rings of various lengths. (HML Report No. ND-11.4.) Robert T. Knapp. OEMsr-207; Section No. 6.1-sr207-920. CIT. July 20, 1943.

M3 Water Tunnel tests of the M-6, 2.36-inch antitank rocket with five designs of shroud ring tail. (HML Report No. ND-11.5.) Robert T. Knapp. OEMsr-207; OSRD No. 3003; Section No. 6.1-sr207-934. CIT. November 4, 1943.

722.3 2.37-Inch Rocket

M1 Water Tunnel tests of the 2.37-inch rocket projectile with collapsible-type tails. (HML Report No. ND-11.1.) Robert T. Knapp. OEMsr-207; OSRD No. 3193; Section No. 6.1-sr207-1314. CIT. January 20, 1943.

M2 Water Tunnel tests of a 2.37-inch rocket projectile with hemispherical noses and ring tails. (HML Report No. ND-11.2.) Robert T. Knapp. OEMsr-207; OSRD No. 3068; Section No. 6.1-sr207-1303. CIT. February 19, 1943.

722.4 3.5-Inch Rotating Rocket

M1 Water Tunnel tests of the 3.5-inch rotating rocket. (HML Report No. ND-27.) Robert T. Knapp and Harold L. Doolittle. OEMsr-207; Section No. 6.1-sr207-1270. CIT. April 21, 1944.

M2 3.5-inch rotating rocket tests with various afterbodies. (HML Report No. ND-27.1.) Robert T. Knapp and Harold L. Doolittle. OEMsr-207; Section No. 6.1-sr207-1903. CIT. January 4, 1945.

722.5 4.5-Inch Rocket

M1 Water Tunnel tests of the 4.5-inch rocket projectile. (HML Report No. ND-12.) Robert T. Knapp. OEMsr-207; Section No. 6.1-sr207-1312. CIT. February 22, 1943.

M2 Water Tunnel tests of the 4.5-inch rocket projectile with three different fin tails and with one ring-type tail. (HML Report No. ND-12.1.) Robert T. Knapp. OEMsr-207; Section No. 6.1-sr207-1304. CIT. May 28, 1943.

M3 Force tests of the 4.5-inch rocket, T-38E3. (HML Report No. ND-41.) Robert T. Knapp and Gerald B. Robison. OEMsr-207; OSRD No. 5113; Section No. 6.1-sr207-1919. CIT. May 1, 1945.

722.6 5-Inch Rocket

M1 Tests of four models of the 5-inch SSR rotating rocket. (HML Report No. ND-33.) Robert T. Knapp and Harold L. Doolittle. OEMsr-207; OSRD No. 5473; Section No. 6.1-sr207-2239. CIT. July 24, 1945.

M2 Tests of the 5-inch HVAR projectile with fin and ring tails. (HML Report No. ND-37.) Robert T. Knapp and Harold L. Doolittle. OEMsr-207; OSRD No. 6094; Section No. 6.1-sr207-2241. CIT. August 20, 1945.

722.7 Miscellaneous Rockets

M1 Water Tunnel tests of the 2-inch diameter projectiles with hemispherical noses and square ends. (HML Report No. ND-10.) Robert T. Knapp. CIT. November 10, 1942.

M2 Water Tunnel tests of a 2½-inch rocket projectile. (HML Report No. ND-11.) Robert T. Knapp. CIT. November 19, 1942.

M3 Water Tunnel tests of the 15-cm German spinner rocket. (HML Report No. ND-23.) Robert T. Knapp. OEMsr-207; Section No. 6.1-sr207-932. CIT. November 11, 1943.

M4 Water Tunnel tests of the 7.2-inch chemical rocket. (HML Report No. ND-22.) Robert T. Knapp and Harold L. Doolittle. OEMsr-207; Section No. 6.1-sr207-1261. CIT. December 22, 1943.

723**Bombs and Hydrobombs**

M1 Water Tunnel tests of the AN-Mark 41 bomb. (HML Report No. ND-14.) Robert T. Knapp. CIT. March 31, 1943.

M2 Water Tunnel tests of the hydrobomb. (HML Report No. ND-29.) Robert T. Knapp and Harold L. Doolittle. OEMsr-207; Section No. 6.1-sr207-1276. CIT. May 13, 1944.

M3 Force and cavitation tests of the Westinghouse hydrobomb. (HML Report No. ND-40.) Robert T. Knapp and Robert M. Peabody. OEMsr-207; OSRD No. 5368; Section No. 6.1-sr207-2234. CIT. June 27, 1945.

M4 Force tests of concrete practice bombs, M-38A2 practice bomb, AN-M43 general purpose 500-lb bomb, AN-M56 light case 4000-lb bomb. (HML Report No. ND-32.) Robert T. Knapp and Robert M. Peabody. OEMsr-207; OSRD No. 5757; Section No. 6.1-sr207-2245. CIT. August 14, 1945.

M5 Force tests of the United Shoe Machinery Corporation No. 8 hydrobomb. (HML Report No.

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ND-29.1.) Robert T. Knapp and Gerald B. Robison. OEMsr-207; OSRD No. 6093; Section No. 6.1-sr207-2247. CIT. August 25, 1945.

- M6** Tests of the AN-Mark 53 aircraft depth bomb. (HML Report No. ND-44.) Robert T. Knapp and Harold L. Doolittle. OEMsr-207; OSRD No. 6091; Section No. 6.1-sr207-2350. CIT. August 31, 1945.

800 TORPEDO STUDIES

- M1** Selected index of British reports on torpedoes. Richard H. Bolt. Special Studies Group. March, 1944.
- M2** Program analysis of the Torpedo Division. (n.a.) OEMsr-287. HUSL. May 30, 1944.
- M3** Conference on program analysis of the Torpedo Division of Harvard Underwater Sound Laboratory, held in the New York Division Six office, June 5, 1944. Richard H. Bolt. [HUSL.] [June, 1944.]
- M4** [A] visit to California Institute of Technology [from] August 27 [to] September 3, 1944. G. F. Wislicenus. Service Project No. NO-176. Special Studies Group. September 9, 1944.
- M5** Studies made in connection with Projects AC-70 and NO-177. William V. Houston. OEMsr-1131; Service Project Nos. AC-70 and NO-177; OSRD No. 53; Section No. 6.1-sr1131-1182. Special Studies Group. October 20, 1944.
- M6** Design of the Mark 25 torpedo. (Parts I and II.) (n.a.) OEMsr-1131; Service Project No. NO-176; OSRD Nos. 6672 and 6673; Section No. 6.1-sr1131-2393. Special Studies Group. December 31, 1945.

810 Hydrodynamics and Aerodynamics

810.1 Torpedo Flight in Air

- M1** Investigation of the control in air of a torpedo with fixed tailplane and gyro-controlled ailerons. (Report No. Gos/Torps/7/42.) L. W. Parkin. OSRD Liaison Office No. WA-1378-26. Torpedo Development Unit [Great Britain]. July, 1942.
- M2** Wind tunnel tests prior to dropping full-sized torpedoes. Harvey A. Brooks and Carl M. Herget. HUSL. December 21, 1943.
- M3** [The] 24-foot wind tunnel tests on four torpedo air tails. (Technical Note No. Aero. 1442.) P. J. Pearsall and T. B. Owen. OSRD Liaison Office No. 2764-3. Royal Aircraft [Establishment, Great Britain]. May, 1944.
- M4** Mechanism of pitch sensitivity of aircraft torpedoes. (Report No. NOC-47.1 (Rev).) Harold Wayland. CIT. February 27, 1945.
- M5** Analysis of aircraft launchings of torpedoes equipped with shroud rings. Karl H. Keller, Marvin Gimprich and W. H. Wilson. OEMsr-1131; Service Project No. NO-176; Section No. 6.1-sr1131-1887. Special Studies Group. March 26, 1945.
- M6** Values of lift and moment coefficient derivatives

for the American Mark 13 aircraft torpedo. (Report No. SRE/UT/9.) B. G. Neal. OSRD Liaison Office No. WA-4557-3. Department of Scientific Research and Experiment [Great Britain]. June, 1945.

- M7** Attitude of torpedoes released from airplanes. Marvin Gimprich. OEMsr-1131; Section No. 6.1-sr1131-1893. Special Studies Group. December 21, 1945.

810.2 Water Entry and Travel

- M1** Free fall of streamlined bodies in water. R. G. Folsom and Morrough P. O'Brien. UCDWR. October 22, 1941.
- M2** A preliminary study of the ballistics of a submerged projectile. (Report No. 603.) (n.a.) CIT. October 23, 1941.
- M3** Summary coefficients of drag and terminal velocities models of underwater projectiles. (Report No. P16/2206.) [Frank C. Gilbert.] NLL. March 10, 1942.
- M4** Selected index of British reports on water entry and water travel. William V. Houston. [Service Project No. NO-176.] Special Studies Group. November, 1943.
- M5** Selected index of California Institute of Technology and miscellaneous reports on water entry and water travel. William V. Houston. Special Studies Group. November, 1943.
- M6** Hydrodynamic properties of the Mark 13-2 and 13-2A torpedoes with plain and shroud ring tails. Leonard I. Schiff. Service Project No. NO-176. Special Studies Group. November 7, 1944.
- M7** Heat treatment of standard Mark 13 torpedo propellers to withstand entry impact forces. W. Harry Johns, Jr. OEMsr-1131; Section No. 6.1-sr1131-1886. Special Studies Group. February 8, 1945.

810.21 Trajectory Studies

- M1** The trajectory of stable underwater projectiles for the case in which the trajectory is nearly vertical and the projectile is traveling at terminal velocity. (Report No. D10/2258.) Calvin A. Gongwer. NLL. May 1, 1942.
- M2** Initial underwater torpedo trajectories after dropping. Charles H. Tindal. OEMsr-287; Section No. 6.1-sr287-778. HUSL. May 25, 1943.
- M3** Analysis of aircraft torpedo drops. The effect of entry conditions and underwater roll on the initial dive. (Report No. TDU/18/1943.) L. W. Parkin and K. D. Tocher. OSRD Liaison Office No. WA-1241-4. Torpedo Development Unit [Great Britain]. August, 1943.
- M4** Observations on the water entry of a torpedo. (Report No. CIT/IOC-14.) R. W. Ager. CIT. November 23, 1943.
- M5** Theoretical depth trajectories [of Project NO-] 149-B. Harvey A. Brooks and Nelson M. Blachman. HUSL. October 31, 1944.

- M6** The effect of trajectory angle and pitch angle on the initial underwater trajectory of the torpedo. Marvin Gimprich. OEMsr-1131; Section No. 6.1-sr1131-1881. Special Studies Group. November 18, 1944.
- M7** Initial dive and recovery of aircraft torpedoes. Leonard I. Schiff. Service Project No. NO-176. Special Studies Group. February 14, 1945.
- 810.22 Dart Tests**
- M1** Tests of darts at the New London Escape Tower [on] September 26, 1941. (Report No. D1/1318.) Leslie J. Hooper. NLL. [September, 1941.]
- M2** Free fall tests of 1-inch x 6-inch brass darts at the Alden Hydraulic Laboratory, Worcester Polytechnic Institute, Worcester, Mass. (Report No. D1/1983.) Leslie J. Hooper. NLL. February 10, 1942.
- M3** High-speed photography of 1-inch x 6-inch darts at the Alden Hydraulic Laboratory, Worcester Polytechnic Institute, Worcester, Mass. ([Parts I and II,] Report No. D1/1985.) Leslie J. Hooper. NLL. February 16, 1942.
- 810.23 Cavitation Studies**
- M1** Relationship between cavitation bubble and entrance air bubble of torpedoes and other projectiles. Robert T. Knapp. [OEMsr-207.] CIT. November 6, 1943.
- M2** Cavitation tests in the Iowa variable-pressure water tunnel. Tunnel characteristics and test procedure for bodies of revolution. Hunter Rouse, John S. McNown and En-Yun Hsu. OEMsr-1353. State University of Iowa. November 30, 1944.
- M3** Cavitation tests in the Iowa variable-pressure water tunnel. Cylindrical body with hemispherical head. Hunter Rouse, John S. McNown and En-Yun Hsu. OEMsr-1353. State University of Iowa. December 4, 1944.
- M4** Cavitation tests in the Iowa variable-pressure water tunnel. Cylindrical body with blunt head. Hunter Rouse, John S. McNown and En-Yun Hsu. OEMsr-1353. State University of Iowa. December 8, 1944.
- M5** Cavitation tests on a systematic series of torpedo heads. Water-tunnel characteristics and test procedure. Hunter Rouse, John S. McNown and En-Yun Hsu. OEMsr-1353; Section No. 6.1-sr1353-2090. State University of Iowa. February 22, 1945.
- M6** Cavitation tests on a systematic series of torpedo heads. [The] 1/4-caliber rounded head. Hunter Rouse, John S. McNown and En-Yun Hsu. OEMsr-1353; Section No. 6.1-sr1353-2193. State University of Iowa. March 10, 1945.
- M7** Cavitation tests on a systematic series of torpedo heads. [The] 1/8-caliber rounded head. Hunter Rouse, John S. McNown and En-Yun Hsu. OEMsr-1353; Section No. 6.1-sr1353-2194. State University of Iowa. March 15, 1945.
- M8** Summary of cavitation tests on a systematic series of rounded torpedo heads. Hunter Rouse, John S. McNown and En-Yun Hsu. OEMsr-1353; Section No. 6.1-sr1353-2330. State University of Iowa. May 31, 1945.
- 820 Torpedo Control Systems**
- M1** Development of depth and steering controls for the Mark 25 torpedo. William V. Houston. OEMsr-1131; Service Project No. NO-176; Section No. 6.1-sr1131-2348. Special Studies Group. July 12, 1945.
- 820.1 Theory of Control**
- M1** Proportional and on-off control systems. (Report No. 44-3510-JCL-GH.) J. C. Lozier. BTL. August 15, 1944.
- M2** Information on Mark 13 dynamics. Harvey A. Brooks. [HUSL.] November 13, 1944.
- 820.2 Types of Torpedo Control**
- 820.21 Steering Control**
- M1** Torpedo steering. William V. Houston. [Special Studies Group.] February 14, 1944.
- M2** Steering control of the Mark 13-2 torpedo. Leonard I. Schiff. Service Project No. NO-176. Special Studies Group. May 29, 1944.
- 820.22 Depth Control**
- M1** Determination of running depth of test torpedoes by a sonic method. (Report No. G10/R165.) Donald A. Proudfoot. NLL. February 18, 1943.
- M2** Analysis of search and pursuit patterns employing mechanical depth control. H. Poritsky and L. J. Savage. OEMsr-1131; Service Project No. NO-181; Section No. 6.1-sr1131-1155. Special Studies Group. December 22, 1943.
- M3** Depth turning radius of Mark 13 with shroud rings in forward position. Gilford G. Quarles. [HUSL.] October 30, 1944.
- M4** Supplement to: Depth turning radius of Mark 13 with shroud ring in forward position. Gilford G. Quarles. [HUSL.] October 31, 1944.
- 830 Torpedo Power Plant**
- M1** Dynamometer tests of aircraft torpedoes. (Report Nos. D-1 and D-2.) George Farnell and Ascher H. Shapiro. Service Project No. NO-176 and MIT Research Project DIC-6228. MIT. May 23 and June 30, 1944.
- M2** An experimental investigation of torpedo power plants. Final report [under] Contract OEMsr-1198. C. Richard Soderberg and Ascher H. Shapiro. OEMsr-1198; MIT Research Project DIC-6228; OSRD No. 6348; Section No. 6.1-sr1198-2385. MIT. August 31, 1945.
- 830.1 Torpedo Igniters**
- M1** Torpedo igniter, Type B, developed by Remington Arms Company, Inc. A. E. Buchanan, Jr.

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OEMsr-1131; Service Project No. NO-176; Section No. 6.1-sr1131-1851. Remington Arms Company, Inc. September 5, 1944.

- M2** Torpedo igniter design and pyrotechnics investigation. (Progress Report No. RDR 45-51.) J. P. Catlin, W. L. Finlay and T. B. Johnson. OEMsr-1131; Service Project No. NO-176; Section No. 6.1-sr1131-2333. Remington Arms Company, Inc. August 31, 1945.

830.2 Torpedo Fuels

- M1** Preliminary experiments with mixtures of tetranitromethane and iso-octane. (Report No. 607.) (n.a.) OEMsr-124. CIT. November 20, 1941.
- M2** Studies of the restricted burning of certain heterogeneous and colloidal propellants. (Report No. 609.) (n.a.) OEMsr-124. CIT. April 15, 1942.
- M3** Study of utilization of tetranitromethane and gasoline as fuel in jet propulsion equipment. (Report No. 610.) (n.a.) OEMsr-124. CIT. April 22, 1942.
- M4** Thermodynamic analysis of the combustion of ethyl alcohol. John A. Goff. OEMsr-1131; Service Project No. NO-176; Section No. 6.1-sr1131-1847. Special Studies Group. September 18, 1944.
- M5** Gas-generating systems for torpedoes. An experimental study of systems using ethyl alcohol and air for combustion and either water or ethyl alcohol as a coolant. (Report No. R-1.) George Farnell, Charles S. Hofmann and others. OEMsr-1189; Service Project No. NO-176 and MIT Research Project DIC-6228. MIT. November 4, 1944.
- M6** Gas-generating systems for torpedoes. An experimental study of the Mark EX-25-0 combustion pot using ethyl alcohol and air for combustion and ethyl alcohol as a coolant. (Report No. R-2.) George Farnell, Charles S. Hofmann and others. OEMsr-1198; Service Project No. NO-176 and MIT Research Project DIC-6228; Section No. 6.1-sr1198-2112. MIT. January 11, 1945.
- M7** An explorative study of the combustion of nitropropane with air and of nitroethane with air. (Report No. C-1.) William A. Reed and Ascher H. Shapiro. Service Project No. NO-176 and MIT Research Project DIC-6228. MIT. February 13, 1945.
- M8** Thermodynamic analysis of the energy producing capabilities of hydrogen peroxide. (Report Nos. T-1 and T-2.) Harold S. Mickley. OEMsr-1289; Service Project No. NO-236 and MIT Research Project DIC-6249; Section No. 6.1-sr1289-2118. MIT. March 28 and June 14, 1945.
- M9** [Torpedo fuels.] (Progress Report Nos. A-1 and A-2.) G. C. Williams and E. P. Neumann. OEMsr-1289; Service Project No. NO-236 and MIT Research Project DIC-6249; Section No. 6.1-sr1289-2119. MIT. April 11 and May 14, 1945.

- M10** Investigation of torpedo fuels. An experimental study of the peroxide-ethanol cycle. (Final report.) (n.a.) OEMsr-1289; Service Project No. NO-236; OSRD No. 6546; Section No. 6.1-sr1289-2391. MIT. November 14, 1945.

830.21 Decomposition Studies

- M1** Decomposition studies. Charles M. Satterfield and Wilburn H. Hoffman. OEMsr-1289; Service Project No. NO-236. MIT. January 30, 1945.
- M2** Decomposition of 50-weight per cent hydrogen peroxide solution using calcium and sodium permanganate. (Progress Report No. C-1.) Charles N. Satterfield and Wilburn H. Hoffman. OEMsr-1289; Service Project No. NO-236 and MIT Research Project DIC-6249; Section No. 6.1-sr1289-2336. MIT. June 28, 1945.

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ACOUSTICALLY-CONTROLLED TORPEDOES

- M1** Comparison of effectiveness of acoustic torpedoes with non-acoustic torpedoes. Chaim L. Pekeris. OEMsr-1131; OSRD No. 157; Section No. 6.1-sr1131-1156. Special Studies Group. February 16, 1944.
- M2** Torpedo instrumentation. A summary of torpedo instruments constructed by Harvard Underwater Sound Laboratory. (n.a.) OEMsr-287; Section No. 6.1-sr287-2174. HUSL. March 5, 1945.
- M3** A torpedo survey on Project [No.] N-121. (n.a.) OEMsr-1131; Service Project No. N-121; Section No. 6.1-sr1131-1892. Special Studies Group. December 22, 1945.

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Listening Torpedoes

- M1** [Mark 18 noise measurements.] Bi-weekly report [on] Projects NO-149 and NO-157. (Report No. XV, covering period [from] November 3 [to] November 16, 1943.) (n.a.) OEMsr-287; Service Project Nos. NO-149 and NO-157; Section No. 6.1-sr287-1169. HUSL. November 19, 1943.
- M2** [Mark 13 and 18 noise measurements.] Bi-weekly report [on] Projects NO-149 and NO-157. (Report No. XIX, covering period [from] December 29, 1943 [to] January 11, 1944.) (n.a.) OEMsr-287; Service Project Nos. NO-149 and NO-157; Section No. 6.1-sr287-1348. HUSL. January 14, 1944.
- M3** [Mark 13 and 18 tests.] Bi-weekly report [on] Projects NO-149 and NO-157. (Report No. XX, covering period [from] January 12 [to] January 25, 1944.) (n.a.) OEMsr-287; Service Project Nos. NO-149 and NO-157; Section No. 6.1-sr287-1354. HUSL. January 28, 1944.
- M4** [Mark 13 and 18 tests.] Bi-weekly report [on] Projects NO-149 and NO-157. (Report No. 34, covering period [from] July 26 [to] August 8, 1944.) (n.a.) OEMsr-287; Service Project Nos. NO-149 and NO-157; Section No. 6.1-sr287-1780. HUSL. August 11, 1944.
- M5** [Acoustic and electronic arrangements for torpedoes required for Projects NO-149 and NO-157.]

Final technical report [of] Contract OEMsr-1097. (n.a.) OEMsr-1097; Service Project Nos. NO-149 and NO-157; Section No. 6.1-sr1097-1334. BTL. September 28, 1945.

911 Airplane-Launched Torpedoes (Project NO-149)

M1 [An air-launched acoustic torpedo, Project NO-149.] (n.a.) OEMsr-287; Service Project No. NO-149; OSRD No. 6620; Section No. 6.1-sr287-2090. HUSL. January 1, 1946.

911.1 Mark 13 (Project NO-149-C)

M1 Tests on various methods of mounting magnetostriction hydrophones in torpedo heads. Robert C. McLoughlin and Harry V. Knorr. [HUSL.] August 1, 1944.

M2 An echo control system for the Mark 13 torpedo, Project [NO-]149-C. (n.a.) OEMsr-1097; Service Project No. NO-149-C; OSRD No. 6069; Section No. 6.1-sr1097-2341. BTL. August 27, 1945.

911.2 Mark 21

M1 [Project NO-]149, Mark 21 torpedo. Final report [under] Contract No. OEMsr-1051. (n.a.) OEMsr-1051; Service Project No. NO-149; OSRD No. 5015; Section No. 6.1-sr1051-2121. Westinghouse Electric and Manufacturing Company, Inc. February 28, 1945.

M2 Noise measurements on a Mark 21 torpedo. (n.a.) OEMsr-287; Section No. 6.1-sr287-2178. HUSL. March 15, 1945.

911.3 Mark 24 (Project NO-94)

M1 Self-produced noise from [a] Mark XXIV mine. Keron C. Morrical, Ray S. Alford and others. OEMsr-287; Section No. 6.1-sr287, sr785-720. HUSL and BTL. January 9, 1943.

M2 Discussion of the stability of the Mark XXIV mine in terms of electrical feedback theory. (Report No. 43-3510-ACD-JCL-TP.) J. C. Lozier and A. C. Dickieson. [BTL.] March 19, 1943.

M3 The dynamical performance of the rudder-rudder motor system used on the Mark 24 mine. R. Clark Jones. [BTL.] March 25, 1943.

M4 Self-noise measurements on Mark 24 mine. (n.a.) OEMsr-287; Section No. 6.1-sr287-900. HUSL. June 28, 1943.

M5 The audio frequency phase system of control for the Mark XXIV mine. Part A, Description of apparatus. Part B, Measurements and tests. Part C, Theory of operation. Part D, Supplementary memoranda. (n.a.) OEMsr-346 and OEMsr-785; OSRD No. 1992; Section No. 6.1-sr785-962. BTL. July, 1943.

M6 Discussion of the tracking performance of the Mark XXIV mine in terms of electrical feedback theory. (Report No. 43-3510-JCL-HS.) J. C. Lozier. BTL. October 26, 1943.

M7 Mark 24 mine performance tests. (n.a.) OEMsr-

287; Section No. 6.1-sr287-1176. HUSL. December 8, 1943.

M8 An air-launched acoustic antisubmarine mine. [Project] NO-94, Fido. (n.a.) OEMsr-287; Service Project No. NO-94; OSRD No. 6648; Section No. 6.1-sr287-2078. HUSL. January 1, 1946.

912 Submarine and Surface-Launched Torpedoes (Project NO-157)

M1 Project NO-157, a submarine-launched acoustic torpedo. (n.a.) OEMsr-287; Service Project No. NO-157; OSRD No. 6626; Section No. 6.1-sr287-2091. HUSL. January 1, 1946.

912.1 Mark 18 (Project NO-157-C)

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- M2** The probabilities of hitting, in train bombing, rectangular targets of proportion one-by-six or one-by-nine. (Division 7 Report to the Services No. 53.) (n.a.) March 10, 1943.
- 121.2 Multiple Hits**
- M1** The theory of multiple hits on multiple targets in train bombing. (Appendices A and B included. Division 7 Report to the Services No. 55.) (n.a.) May 10, 1943.
- 122 Bombsights and Sighting**
- 122.1 Angular Rate Bombsight**
- M1** [Angular rate bombsights.] (Progress Report Nos. 1 [to] 11, for [the period from] June 16, 1942 [to] March 25, 1944.) Leo Goldberg, Robert R. McMath and H. E. Sawyer. OEMsr-504.
- M2** Preliminary instructional note on the low-level bombsight, Mark III. (Instructional Leaflet No. Inst-348.) (n.a.) OSRD Liaison Office No. WA-629-1L. [Royal Aircraft Establishment, Great Britain.] February, 1943.
- M3** Notes on low-altitude bombing. [Part] I, Range errors for angular depression and angular rate methods. (n.a.) Research Project No. 33. Franklin Institute and Applied Mathematics Panel. May 24, 1943.
- M4** Notes on low-altitude bombing. [Part] II, Effect of a rangewise impact-point offset on range errors for angular depression and angular rate methods. (n.a.) Research Project No. 33. Franklin Institute. June 2, 1943.

- M5** Notes on low altitude bombing. [Part] III, Practical evaluation of composite range errors for angular depression and angular rate methods. (n.a.) Research Project No. 33. Franklin Institute. June 15, 1943.
- M6** Notes on low-altitude bombing. [Part] IV, Range errors for the slant range method. (n.a.) Research Project No. 33. Franklin Institute. (n.d.)
- M7** Notes on low-altitude bombing. [Part] V, Range errors for the angular rate hybrid method. (n.a.) Research Project No. 33. Franklin Institute. July 30, 1943.
- M8** Notes on low-altitude bombing. [Part] VI, Range errors for angular depression and angular rate methods in glide bombing. (n.a.) Research Project No. 33. Franklin Institute. September 11, 1943.
- M9** Notes on low-altitude bombing. [Part] VII, Range errors for higher velocity releases. (n.a.) Franklin Institute. March 8, 1944.
- M10** Letters to Lieutenant R. J. Teich. Subject: Sketches for low-altitude bombing. Saunders MacLane. [Applied Mathematics Panel.] April 25 and 27, 1944.
- M11** Angular rate bombsight, Mark 23. C. F. Shriver, W. Bornemann and Henry Harrison. OEMsr-56; Problem No. DD-2492QQ. Eastman Kodak Company. October 25, 1945.
- M12** The stabilized angular rate bombsight, Mark 25, Model O. C. F. Shriver, W. Bornemann and others. OEMsr-56; Problem No. DD-2492MM. Eastman Kodak Company. October 29, 1945.
- M13** The Mark 23 low-altitude angular rate bombsight. (n.a.) OEMsr-504; Research Project No. M-419. University of Michigan. November 30, 1945.
- M14** A summary and compilation of reports on the theory, mechanization and testing of bombsights employing the angular rate principle. (n.a.) January, 1946.

122.2 Mark 20

- M1** Automatic altitude adjustment for bombsight, Mark 20. (Report No. 330-1706-161 [covering period from] October 20, 1943 [to] January 24, 1944.) U. C. S. Dilks. OEMsr-330; Service Project No. NO-129; OSRD No. 5080. Franklin Institute. January 24, 1944.
- M2** Instruction manual [for the] bombsight, Mark 20. (Report No. 330-1706-200 [for the period] August 20, 1942 [to] March 31, 1944.) John A. Bevan. OEMsr-330; Service Project No. NO-129; OSRD No. 5082. Franklin Institute. March 31, 1944.

122.3 Triangle Solver

- M1** Final report [under] Contract No. OEMsr-1044 for [the period from] May 27, 1943 [to] October 31, 1945. Part 1, History of the contract and patent disclosures. B. B. Willis. OEMsr-1044; Service Project No. NO-166. Librascope, Inc. October 31, 1945.

- M2** Final report [under] Contract No. OEMsr-1044 for [the period from] May 27, 1943 to October 31, 1945. Part 2, Triangle solver for Eagle Project Delta. D. C. Webster. OEMsr-1044; [Service Project No. NO-166]. Librascope, Inc. October 22, 1945.
- M3** Final report [under] Contract No. OEMsr-1044 for [the period from] May 27, 1943 to October 31, 1945. Part 3, Triangle solvers for H2X Bombing Project Alpha. D. C. Webster. OEMsr-1044; [Service Project No. NO-166]. Librascope, Inc. October 18, 1945.
- M4** Final report [under] Contract No. OEMsr-1044 for [the period from] May 27, 1943 to October 31, 1945. Part 4, Triangle solver for laboratory use. [Project] Gamma. D. C. Webster. OEMsr-1044; [Service Project No. NO-166]. Librascope, Inc. October 18, 1945.
- M5** Final report [under] Contract No. OEMsr-1044 for [the period from] May 27, 1943 to October 31, 1945. Part 5, Redesign of triangle solver for Eagle Project Beta. D. C. Webster. OEMsr-1044; [Service Project No. NO-166]. Librascope, Inc. October 18, 1945.
- M6** Final report [under] Contract No. OEMsr-1044 for [the period from] May 27, 1943 to October 31, 1945. Part 6, Preliminary ballistics computer for a gun director system. [Project] Eta. (n.a.) OEMsr-1044; [Service Project No. NO-166]. Librascope, Inc. [October 30, 1945].
- M7** Final report [under] Contract No. OEMsr-1044 for [the period from] May 27, 1943 to October 31, 1945. Part 7, Ballistic computer, Mark 42, Model O. [Project] Rho. D. C. Webster. OEMsr-1044; [Service Project No. NO-166]. Librascope, Inc. October 30, 1945.
- M8** Final report [under] Contract No. OEMsr-1044 for [the period from] May 27, 1943 to October 31, 1945. Part 8, Ballistic computer, Mark 42, Model 1, Serial No. 1. D. C. Webster. OEMsr-1044; [Service Project No. NO-166]. Librascope, Inc. October 31, 1945.

122.4 Miscellaneous Bombsight Problems

- M1** Bombsight attachment for guiding razon bombs. (Division 7 Report to the Services No. 97. Report No. 330-1706-194 [for the period] November, 1943 [to] October 10, 1944.) John A. Bevan. OEMsr-330; Service Project No. AC-36; OSRD No. 5740. Franklin Institute. October 10, 1944.
- M2** Hand-held bombsights for airships. (Report No. 330-1706-178 [for the period] August, 1943 [to] November, 1944.) John A. Bevan. OEMsr-330; Service Project No. NO-190; OSRD No. 5087. Franklin Institute. November, 1944.

123 Computers

- M1** Computer for slant range at low altitude. (Report No. 330-1706-156 [for the period] July 31, 1943 [to] November 5, 1943.) R. W. Pitman. OEMsr-330; Service Project No. NA-168; OSRD No. 5084. Franklin Institute. November 5, 1943.

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- M2** Model III preset bombing computer. (Report No. 330-1706-189 [for the period] November, 1943 [to] July, 1944.) John A. Bevan. OEMsr-330; Service Project No. NO-191; OSRD No. 5088. Franklin Institute. July 7, 1944.
- 124 Bombing Systems**
- 124.1 Train Bombing**
- M1** A study of train bombing. (Division 7 Report to the Services No. 33.) (n.a.) OEMsr-65; Service Project No. AC-27. Princeton University. August 25, 1942.
- 124.2 Scatter Bombing**
- M1** Scatter bombing. (Division 7 Report to the Services No. 34.) H. H. Germond. September 14, 1942.
- 130 Rocketry**
- 131 Grasp Sight**
- M1** [The] Grasp sight for forward-firing aircraft rockets, Model I. (Report No. 330-1706-211 [for the period] August 30, 1944 [to] April 9, 1945.) Eugene P. Cooper and Marjorie C. Cooper. OEMsr-330; Service Project No. NO-216; OSRD No. 4991. Franklin Institute. April 9, 1945.
- M2** The Grasp rocket sight, Model II. (Report No. 330-1706-213 [for the period] January 15 [to] September 30, 1945.) Eugene P. Cooper and Marjorie C. Cooper. OEMsr-330; Service Project No. NO-216; OSRD No. 6040. Franklin Institute. September 30, 1945.
- 132 Rasp Sight**
- M1** The Rasp rocket sight, Model I. (Report No. 330-1706-188 [for the period] February 1, 1944 to August 17, 1944.) U. C. S. Dilks, E. C. Lewis and others. OEMsr-330; Service Project No. NO-216. Franklin Institute. August 17, 1944.
- M2** The Rasp rocket sight, Model III. (Report No. 330-1706-206 [for the period] September 1, 1944 [to] January 31, 1945.) U. C. S. Dilks, E. C. Lewis and W. C. Sheppard. OEMsr-330; Service Project No. NO-265; OSRD No. 5091. Franklin Institute. February 1, 1945.
- 140 Torpedoes**
- 141 Directors**
- M1** Torpedo director, Mark 32. (Report No. 330-1706-172 [for the period] September 2, 1942 [to] January 26, 1944.) R. W. Pitman. OEMsr-330; Service Project No. NO-106; OSRD No. 5079. Franklin Institute. January 26, 1944.
- M2** Prediction mechanism for torpedo director for destroyers and light cruisers. (n.a.) Project Nos. NO-197 and NDRC-72. General Electric Company. June 3, 1944.
- M3** Torpedo director, Mark 34, for motor torpedo boats. ([Report covering period from] July 1, 1943 to September 30, 1945.) R. E. Coutant. OEMsr-1208; Service Project Nos. NO-134 and NO-197. General Electric Company. September 29, 1945.
- 200 RANGE FINDERS AND TRACKING**
- 201 Summary Reports**
- M1** Final Report No. 27 [on] Contract NDCrc-186. Volume I, Summary. (n.a.) NDCrc-186. Princeton University. January 31, 1943.
- M2** Final report [on] Contract NDCrc-186. Volume II, Report [Nos.] 1-16. (n.a.) NDCrc-186. Princeton University. January 31, 1943.
- M3** Final report [on] Contract NDCrc-186. Volume III, Report [Nos.] 17-26. (n.a.) NDCrc-186. Princeton University. January 31, 1943.
- M4** Final report [on] Contract NDCrc-186. Volume IV, Reports of progress and proposed programs. (n.a.) NDCrc-186. Princeton University. January 31, 1943.
- M5** Final report [on] Contract NDCrc-186. Volume V, Stereoscopic Testing Center progress reports. (n.a.) NDCrc-186. Princeton University. January 31, 1943.
- M6** Final report [on] Contract NDCrc-186. Volume VI, Height finder studies, [Nos.] O to VIII. (n.a.) NDCrc-186. Princeton University. January 31, 1943.
- M7** Final report [on] Contract NDCrc-186. Volume VII, Height finder studies, [Nos.] IX to XVI. (n.a.) NDCrc-186. Princeton University. January 31, 1943.
- M8** Final report [on] Contract NDCrc-186. Volume VIII, Director studies. (n.a.) NDCrc-186. Princeton University. January 31, 1943.
- 210 Ranging Instruments**
- M1** [Effect of stopping down end-windows of range finders.] (Division 7 Progress Report to the Services No. 21.) (n.a.) February 11, 1942.
- M2** Retention of helium in range and height finders. (Division 7 Report to the Services No. 50.) (n.a.) [NDCrc-186 and OEMsr-562.] Princeton University and American Gas Association Testing Laboratories. March 1, 1943.
- M3** Range and height finder problems. Comments on Branch Memorandum No. 5. (n.a.) [April, 1943(?)]
- M4** Factors influencing the use and construction of range and height finders. (Division 7 Report to the Services No. 70.) (n.a.) January 5, 1944.
- M5** Final report on [Contract] OEMsr-1016. Part I, Experimental range finder, Type I, and a study of aided ranging. Harry G. Ott. OEMsr-1016. Bausch and Lomb Optical Company. May 30, 1945. Part II, Status as of January 31, 1945 of the development of a range finder in accordance with Proposal No. 4 referred to in the minutes of meeting of Steering Committee for Project 58 on September 15, 1943. O. H. Wolferts. [OEMsr-1016.] [Bausch and Lomb Optical Company.] [January 31, 1945.]

- M6** Photographic measurements of atmospheric boil, with some preliminary theoretical considerations of the relation of boil to range finder magnification and base length. Lorrin A. Riggs, C. G. Mueller and others. OEMsr-1059. Brown University. August 6, 1945.

210.1 Range Finders

- M1** A proposed optical design for super range finder. Joseph Mihalyi. Problem No. [DD-]1621. Eastman Kodak Company. April 15, 1943.
- M2** Tank fire control. Visual range estimation. Range finders and range finder fields. (Division 7 Report to the Services No. 77.) (n.a.) Bausch and Lomb Optical Company. February, 1944.

210.11 Errors and Factors Influencing Accuracy

- M1** Experiments attempting to analyze out some of the optical factors involved in real haze. (n.a.) [December 26, 1940(?)]
- M2** Reduction of range and height finder errors due to temperature stratification. (Division 7 Progress Report to the Services No. 12.) (n.a.) August 29, 1941.
- M3** Relation of accuracy and variability of stereoscopic antiaircraft range finding operation to correct interocular setting of the instrument. (Division 7 Report to the Services No. 29.) (n.a.) May 25, 1942.
- M4** Relative position of reticle and target in the stereoscopic range finder. (Division 7 Report to the Services No. 28.) (n.a.) May 27, 1942.
- M5** Descriptive summary of errors made with the M-1 height finder during field tests at Fort Monroe. (Division 7 Report to the Services No. 54.) (n.a.) Princeton University. October 28, 1942.
- M6** Relation of blurredness to the precision of stereo settings. Glenn A. Fry, Charles S. Bridgman and others. [OEMsr-637.] [Ohio State University.] [July 1, 1943.]
- M7** Factors influencing the magnitude of range errors in free space and in telescopic vision. Alfred H. Holway, Dorothea A. Jameson and others. [OEMsr-555.] Harvard University. August 10, 1945.
- M8** Effects of the intermittent visibility of low contrast targets on stereo range measurements. Glenn A. Fry, Charles S. Bridgman and V. E. Ellerbrock. [OEMsr-637.] [Ohio State University.] (n.d.)

210.111 Atmospheric Scattering

- M1** Effect of atmospheric scattering upon the appearance of a dark object against a sky background. Glenn A. Fry and Charles S. Bridgman. [OEMsr-637;] Research Project No. 10. Ohio State University. July 28, 1942.
- M2** The influence of atmospheric scattering in range finding. [Glenn A. Fry and Charles S. Bridgman.] [OEMsr-637;] Research Project No. 10. Ohio State University. August 21, 1942.

210.112 Internal Adjuster Finders

- M1** Interocular adjustment of stereoscopic range finders. (Division 7 Report to the Services No. 76.) (n.a.) January 13, 1943.
- M2** A comparison of various visual patterns for use in connection with the internal adjuster system of a range finder. (Report No. 2.) Lorrin A. Riggs and Roberta M. Daley. OEMsr-1059. Brown University. September 10, 1943.
- M3** Comparative study of internal adjuster targets of range and height finders. (Division 7 Report to the Services No. 69.) (n.a.) OEMsr-570; Research Project No. 44. Brown University. November 29, 1943.
- M4** Monocular vs binocular internal adjuster settings. Lorrin A. Riggs. [Brown University.] February 16, 1944.
- M5** A modification of the internal adjuster system of the stereoscopic range finder, Mark 65, with comparative data on the effects of temperature on the modified and the standard instruments. Lorrin A. Riggs, C. G. Mueller and F. A. Mote. OEMsr-1059. Brown University. July 21, 1945.
- M6** The accuracy and precision of internal adjuster settings using single bars and parallel bars as targets. Glenn A. Fry, Charles S. Bridgman and others. [OEMsr-637.] Ohio State University (n.d.)

210.12 Pentareflectors

- M1** Distortions of thin slabs due to temperature gradients. (Report No. 55.) William A. Arnold. [OEMsr-952.] Eastman Kodak Company. May 1, 1944.
- M2** Elimination of thermal effects in pentareflectors. (Report No. 56.) William A. Arnold and Wayne G. Norton. [OEMsr-952.] Eastman Kodak Company. July 12, 1944.
- M3** Reduction of temperature effects in pentareflectors and optical bars. (Division 7 Report to the Services No. 85.) (n.a.) OEMsr-1016 and OEMsr-952. Bausch and Lomb Optical Company and Eastman Kodak Company. October 11, 1944.

210.13 Optical Systems

- M1** Range finder optical systems. J. A. Anderson, Ira S. Bowen and others. [NDCrc-123.] California Institute of Technology. 1942.
- M2** Range finder optical systems. (Supplement.) J. A. Anderson, Ira S. Bowen and others. [NDCrc-123.] California Institute of Technology. 1942.
- M3** Instructions for operating and maintenance of the experimental 10-cm radio-optical range finder, Mickey. (n.a.) Research Project No. 14. Bell Telephone Laboratories, Inc. [1942(?)]
- M4** Tests made of range finder optical systems at California Institute of Technology. (Division 7 Report to the Services No. 51.) J. A. Anderson, Ira S. Bowen and others. OSRD No. 1257. California Institute of Technology. February 20, 1943.

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210.14 Coincidence Range Finders

- M1** Comparative test of coincidence and stereoscopic height finders. (Division 7 Report to the Services No. 42.) Merrill M. Flood. NDCrc-186; OSRD No. 1129. Princeton University. October 28, 1942.
- M2** A further analysis of the precision of range corrector settings for small monocular range finders. (Progress Report No. 10.) (n.a.) [OEMsr-570;] Research Project No. 44. Brown University. January 26, 1943.
- M3** An analysis of the precision and subject variation of range corrector settings for small monocular range finders. (Progress Report No. 13.) (n.a.) OEMsr-570; Research Project No. 44. Brown University. February 15, 1943.
- M4** The effect of illumination on the precision of range corrector settings for small monocular range finders. (Progress Report No. 16.) (n.a.) OEMsr-570; Research Project No. 44. [Brown University.] April 9, 1943.
- M5** Operating instructions and description of the Eastman experimental model 1-meter infantry range finders, T-25 and T-26. Joseph Mihalyi and F. M. Bishop. [OEMsr-56.] Eastman Kodak Company. [February, 1944.]

210.15 Stereoscopic Range Finders

- M1** Comparisons of precision at 12 and 24-power of observations taken with the M-1 height finder for fixed ground targets and moving aerial targets. (Division 7 Report to the Services No. 41.) Merrill M. Flood. NDCrc-186; OSRD No. 1130. Princeton University. January 20, 1943.
- M2** Perspective effects in stereoscopic range finders. (Division 7 Report to the Services No. 40.) (n.a.) [NDCrc-186.] Princeton University and National Bureau of Standards. [December 30, 1942.]
- M3** Maintaining contact on a moving target with a stereoscopic range finder. Glenn A. Fry, Charles S. Bridgman and others. [OEMsr-637.] [Ohio State University.] November 15, 1943.
- M4** A combination tracking telescope and contrast meter for a stereoscopic range finder. Glenn A. Fry, Charles S. Bridgman and others. [OEMsr-637.] [Ohio State University.] November 30, 1943.
- M5** Stereo aid for Maxson turret. (Division 7 Report to the Services No. 107.) Joseph Mihalyi. OEMsr-56; Problem No. DD-2492TT. Eastman Kodak Company. November 26, 1945.

210.16 Ortho-Pseudo Range Finders

- M1** Ortho-pseudoscopic range finder. (Division 7 Report to the Services No. 43.) (n.a.) OEMsr-55 and NDCrc-186. Eastman Kodak Company and Princeton University. October 29, 1942.
- M2** An ortho-pseudo stereoscopic 1-meter base range finder. Joseph Mihalyi and F. M. Bishop. OEMsr-56; Problem No. DD-2492LL. Eastman Kodak Company. November 10, 1944.
- M3** Ortho-pseudo super range finder. Joseph Mihalyi, Otto Wittel and Martin S. Maier. OEMsr-952;

Problem No. DD-1621. Eastman Kodak Company. November 22, 1944.

210.17 Short-Based Range Finders

- M1** The development of short-base range finders. (Division 7 Report to the Services No. 26.) (n.a.) May 15, 1942.
- M2** Full-field coincidence range finder of 15-inch base provided with continuously adjustable range compensation. Joseph Mihalyi and F. M. Bishop. OEMsr-56; Problem No. DD-2492R. Eastman Kodak Company. May 21, 1942.
- M3** Field tests of Eastman Kodak 15" and Polaroid 43" base range finders. (Division 7 Report to the Services No. 45.) (n.a.) December, 1942.
- M4** Tests of 15-inch range finder. D. F. Lyman and F. M. Bishop. OEMsr-56; Problem No. DD-2492AA. Eastman Kodak Company. December 4, 1942.
- M5** [The] 15-inch full-field superimposed-image type close distance range finder. (n.a.) [OEMsr-56.] Eastman Kodak Company. April 7, 1944.
- M6** Short-base range finders. (Division 7 Report to the Services No. 108.) Joseph Mihalyi. OEMsr-56; Problem Nos. DD-2492Q, R, X, DD and II. Eastman Kodak Company. November 19, 1945.

210.18 Auto-Collimating Range Finders

- M1** Auto-collimating systems for range finders. Stephen M. MacNeille and F. M. Bishop. OEMsr-56; Problem Nos. [DD-]2492R and [DD-]2492S. Eastman Kodak Company. June 9, 1942.
- M2** Range finder auto-collimation and applications. Stephen M. MacNeille and F. M. Bishop. OEMsr-56; Problem No. DD-2492S. Eastman Kodak Company. April 24, 1943.
- M3** Auto-collimating stereoscopic range finder with minimum stratification influence. (Proposal Nos. 1 and 2.) O. H. Wolferts. [OEMsr-1016.] Bausch and Lomb Optical Company. September 10, 1943.

210.19 Miscellaneous Range Finders and Related Problems

- M1** A proposed polarizing beam-splitter. George J. Koch. OEMsr-952; Problem No. DD-1621. Eastman Kodak Company. November 1, 1944.
- M2** [The] 13½-foot superimposed range finder. Joseph Mihalyi and F. M. Bishop. OEMsr-56; Problem No. DD-2492HH. Eastman Kodak Company. November 10, 1944.
- M3** [Range finder problems.] Final report on OEMsr-302. (n.a.) OEMsr-302. Polaroid Corporation. November 30, 1944.
- M4** A proposed form of two-station range finder. Edwin C. Fritts. OEMsr-56; Problem Nos. DD-2492M, U and W. Eastman Kodak Company. December 5, 1944.

210.2 Height Finders

- M1** Comparative test of coincidence and stereoscopic height finders. (Report No. 12.) Merrill M. Flood.

NDCrc-186. Princeton University. Revised: August 12, 1942.

M2 The design and construction of a height finder sunshade. (Memorandum No. 8.) William E. Kappauf. OEMsr-815; OSRD No. 1637. Brown University. June 15, 1943.

M3 A study of backlash between the main bearing race and the bevel pinion in M-1 and M-2 height finders. (Report No. 8.) William C. Biel, William E. Kappauf and E. B. Knauft. OEMsr-815. Brown University. September 9, 1943.

210.21 Errors and Factors Influencing Accuracy

M1 The use of helium as a charge for the M-1 height finder. (Report No. 4.) (n.a.) [NDCrc-186.] Research Project No. 8. Princeton University. August 18, 1941.

M2 One source of error in the M-1 height finder. William A. Arnold, Stephen M. MacNeille and F. M. Bishop. OEMsr-56; Problem No. DD-2492V. Eastman Kodak Company. October 7, 1942.

M3 Temperature effects in stereoscopic height finders. (Division 7 Report to the Services No. 38.) (n.a.) NDCrc-186 and OEMsr-56. Princeton University, Eastman Kodak Company and National Bureau of Standards. October 8, 1942.

M4 Descriptive summary of errors made with the M-1 height finder during field tests at Fort Monroe. (Division 7 Report to the Services No. 54.) (n.a.) OSRD No. 1363. Princeton University. April 15, 1943.

M5 A study of range errors in M-1 height finders produced by the pentareflectors and the optical bar mount. Martin S. Maier and William A. Arnold. OEMsr-952; Problem No. DD-2492NN. Eastman Kodak Company. August 18, 1944.

210.22 Optical Bars

M1 Laboratory tests on comparative performance of Invar and steel height finder optical bars. (Report No. 1.) (n.a.) OEMsr-1016. Bausch and Lomb Optical Company. June 25, 1944.

210.23 Mirrors

M1 A mirror stereoscope device for simulating a moving target within the field of a stereoscopic height finder. (Report No. 10.) C. G. Mueller and Lorrin A. Riggs. OEMsr-1059. Brown University. May 4, 1944.

M2 Effect of temperature gradient on mirror flatness. (n.a.) (n.d.)

210.3 Reticles

(See also: 210.1, 210.14 and 210.2)

210.31 Patterns and Designs

M1 Reticle design. The circle reticle. (n.a.) Research Project No. 10. Tufts College. April 22, 1942.

M2 A proposed optical design for a super range finder of the [stereo] reticle type. (n.a.) [OEMsr-1016.] [Bausch and Lomb Optical Company.] [1943.]

M3 Precisions and constant errors of stereoscopic settings as influenced by differences in reticle pattern. Reticle patterns based on service reticles. (Report No. 11.) Lorrin A. Riggs, C. G. Mueller and Roberta M. Daley. OEMsr-1059. Brown University. May 9, 1944.

M4 Methodological considerations having to do with the type of course used in experiments on reticle design and the reliability of experimenters' determinations. (Report No. 12.) Marion S. Borod, Roberta M. Daley and others. OEMsr-1059. Brown University. May 19, 1944.

M5 The influence of two reticle patterns, the Navy open diamond and a three-dot pattern, on precision of stereoscopic settings. (Report No. 13.) Lorrin A. Riggs and Roberta M. Daley. OEMsr-1059. Brown University. May 26, 1944.

M6 Results obtained with various patterns of opaque reticle. (Report No. 16.) C. G. Mueller, R. L. Solomon and Marion S. Borod. OEMsr-1059. Brown University. August 17, 1944.

M7 Note on false fusion in various reticle patterns. (Progress Report No. 18.) Roberta M. Daley and Clarence H. Graham. OEMsr-1059. Brown University. September 22, 1944.

M8 The influence of height of adjustment errors on the precision and accuracy of ranging on four reticle patterns. (Progress Report No. 23.) Clarence H. Graham, Lorrin A. Riggs and others. OEMsr-1059. Brown University. November 16, 1944.

M9 Studies of the design of opaque reticles for stereoscopic range and height finders. (Division 7 Report to the Services No. 89.) Clarence H. Graham, Lorrin A. Riggs and others. OEMsr-1059. Brown University. March, 1945.

M10 Summary of research on the design of illuminated reticles. Clarence H. Graham, Lorrin A. Riggs and others. OEMsr-1059. Brown University. June 16, 1945.

210.32 Imperfections

M1 The reliability of reticle inspection. (Report No. 4.) Roberta M. Daley and Clarence H. Graham. OEMsr-1059. Brown University. December 30, 1943.

M2 Preliminary experiment on the effects of extraneous stimuli (imperfections) in the reticle field upon precision and consistency of stereoscopic performance. (Report No. 5.) R. L. Solomon and Clarence H. Graham. OEMsr-1059. Brown University. January 10, 1944.

M3 The effect of imperfections in the reticle field of stereoscopic range finders. (Division 7 Report to the Services No. 83.) Roberta M. Daley, Clarence H. Graham and others. OEMsr-1059; OSRD No. 3866. Brown University. July, 1944.

210.33 Precision of Stereoscopic Settings

M1 An apparatus for the comparison of stereoscopic settings with different reticles, together with some

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- illustrative results. (n.a.) [OEMsr-1059;] Research Project No. 10. Brown University. June 15, 1942.
- M2** The relationship between eyepiece diopter settings and stereo range settings. (Report No. 10.) Arthur C. Hoffman. OEMsr-581; OSRD No. 1729. Tufts College. August 3, 1943.
- M3** A preliminary experiment on the comparative precisions of settings made with four stereoscopic reticle patterns. (Report No. 3.) Lorrin A. Riggs and Roberta M. Daley. OEMsr-1059. Brown University. November 10, 1943.
- M4** The effect of position of fore and aft reticle marks on precision of stereoscopic settings. Preliminary results. (Report No. 6.) Roberta M. Daley, Clarence H. Graham and Lorrin A. Riggs. OEMsr-1059. Brown University. February 8, 1944.
- M5** Precision of stereoscopic settings as influenced by distance of target from a fiducial line. (Report No. 7.) Clarence H. Graham, Roberta M. Daley and R. L. Solomon. OEMsr-1059. Brown University. February 9, 1944.
- M6** An investigation of reticle factors which might possibly influence precision of stereoscopic setting. (Report No. 9.) Roberta M. Daley, Clarence H. Graham and Lorrin A. Riggs. OEMsr-1059. Brown University. March 28, 1944.
- M7** Precisions and constant errors of stereoscopic settings as influenced by extraneous stimuli in the reticle field. Experiments involving stereoscopic movement and tracking errors. (Report No. 14.) Clarence H. Graham, R. L. Solomon and C. G. Mueller. OEMsr-1059. Brown University. June 3, 1944.
- M8** Effect of reduced contrast between the target and its background in stereo range finding. Glenn A. Fry, Charles S. Bridgman and V. E. Ellerbrock. [OEMsr-637;] Ohio State University. (n.d.)
- 210.34 Errors and Accuracy of Performance**
- M1** A method for approximating the point of zero error in ranging on artificial stereoscopic targets within a reticle field. (Progress Report No. 12.) (n.a.) [OEMsr-1059;] Research Project No. 44. Brown University. January 29, 1943.
- M2** Precisions obtained with fore and aft fiducial marks at different apparent depths but constant separation in the stereoscopic plane. (Report No. 8.) Roberta M. Daley, Lorrin A. Riggs and Clarence H. Graham. OEMsr-1059. Brown University. February 15, 1944.
- M3** The ability of stereoscopic observers to signal loss of contact with the reticle. Aided ranging on a diving target. (Report No. 15.) Clarence H. Graham, Lorrin A. Riggs and others. OEMsr-1059. Brown University. July 28, 1944.
- M4** Stereoscopic performance on different reticles in the absence of fine elevation adjustments. (Progress Report No. 17.) R. L. Solomon, Clarence H. Graham and Roberta M. Daley. OEMsr-1059. Brown University. September 11, 1944.
- M5** Stereoscopic performance for different reticles as influenced by height of adjustment errors in components of the visual fields. (Progress Report No. 21.) Lorrin A. Riggs, C. G. Mueller and others. OEMsr-1059. Brown University. October 21, 1944.
- M6** Stereoscopic performance when a stationary target is partially obscured by reticle lines of various thicknesses. (Progress Report No. 22.) C. G. Mueller, Roberta M. Daley and F. A. Mote. OEMsr-1059. Brown University. November 10, 1944.
- M7** Further experiments on height of image error. Effect of fore and aft marks and a horizontal line. Precisions and accuracies of height of image adjustment. (Progress Report No. 25.) Clarence H. Graham, Lorrin A. Riggs and others. OEMsr-1059. Brown University. January 19, 1945.
- 220 Testing and Training of Personnel**
- 220.1 Testing**
- M1** [Testing of personnel;] Progress report [of] Project No. 10. Leonard Carmichael, John L. Kennedy and others. [OEMsr-66;] Research Project No. 10. Tufts College. [February, 1942.]
- M2** [Testing of personnel;] Progress report [of] Project No. 10. Clarence H. Graham, Lorrin A. Riggs and others. [OEMsr-66;] Research Project No. 10. Brown University. [February 9, 1942.]
- M3** Visual problems in fire control. Progress report of Project No. 10. Ross A. McFarland, Alfred H. Holway and others. Research Project No. 10. February 9, 1942.
- 220.11 Emotional, Psychological and Neurotic Tests**
- M1** [Effect of electric shock trials on fusion;] Progress report [of] Project No. 10. (n.a.) Research Project No. 10. Brown University. September 15, 1941.
- M2** Experiments with British seamen [at] Fort Monroe and Providence, October 8 to 17, 1941. (n.a.) [October, 1941.]
- M3** [Electrical shock and apprehension tests on six British seamen;] Progress report [of] Project No. 10. (n.a.) Research Project No. 10. Brown University. November 25, 1941.
- M4** Tests of emotional stability. (Division 7 Progress Report to the Services No. 18.) (n.a.) Research Project No. 10. Brown University. January 5, 1942.
- M5** [Psychological tests of Brown University students;] Memorandum to Steering Committee [of] Project No. 10. Clarence H. Graham. Research Project No. 10. Brown University. March 27, 1942.
- M6** Further analysis of the National Research Council Neurotic Inventory. Memorandum to Steering Committee [of] Project No. 10. Clarence H. Graham. Research Project No. 10. Brown University. April 9, 1942.
- M7** [Psychological tests;] Progress report [of] Project No. 10. (n.a.) Research Project No. 10. Brown University. April 25, 1942.
- M8** The relation of National Research Council Neu-

- rotic Inventory scores and intelligence. (Division 7 Report to the Services No. 27.) Clarence H. Graham. Research Project No. 10; OSRD No. 618. Brown University. May, 1942.
- M9** Preliminary analyses of the National Research Council Neurotic Inventory. (n.a.) Brown University. Research Project No. 10. June 15, 1942.
- M10** Preliminary results with a battery of tests developed for the selection of emotionally unstable service personnel. (n.a.) Research Project No. 10. Brown University. June 15, 1942.
- M11** A method for determining reaction time of binocular fusion under conditions of stress. (n.a.) Research Project No. 10. Brown University. June 15, 1942.
- M12** Selection of emotionally unstable personnel. Summary report of work done under Contract OEMsr-66, Project No. 10, Section D-2, NDRC. Clarence H. Graham, Lorrin A. Riggs and others. OEMsr-66; Research Project No. 10. Brown University. July 20, 1942.
- M13** Shock-fusion performance of submarine men. (Progress Report No. 2.) (n.a.) Research Project No. 44. Brown University. September 9, 1942.
- M14** Evaluation of procedures used in the Brown University research at the US Submarine Base, New London, Connecticut. (Progress Report No. 3.) (n.a.) Research Project No. 44. Brown University. September 21, 1942.
- M15** The two-hand coordination test performance of submarine men. (Progress Report No. 5.) (n.a.) Research Project No. 44. Brown University. September 28, 1942.
- M16** Item Analysis [No.] IV on the National Research Council Neurotic Inventory [tests taken by the] Submarine School population. (Progress Report No. 7.) (n.a.) Research Project No. 44. Brown University. November 3, 1942.
- M17** Selectivity of a battery of tests. Psychiatric criterion. (Progress Report No. 8.) (n.a.) OEMsr-570; Research Project No. 44. Brown University. December 3, 1942.
- M18** Item Analysis [No.] V on the National Research Council Neurotic Inventory [tests taken by the] Submarine School population. (Progress Report No. 11.) (n.a.) Brown University. January 27, 1943.
- M19** Results for selective experiments at the US Submarine Base, New London, February, 1943. (Progress Report No. 14.) (n.a.) Research Project No. 44. Brown University. February 27, 1943.
- M20** Selective data and tank performance [at the] US Submarine Base, New London, Connecticut. (Progress Report No. 15.) (n.a.) OEMsr-570; Research Project No. 44. Brown University. March 8, 1943.
- 220.12 Stereo and Vernier Acuity**
- M1** The effect of blurredness of target on stereo judgments. Glenn A. Fry, V. E. Ellerbrock and Charles S. Bridgman. Research Project No. 10. [Ohio State University.] November 27, 1941.
- M2** A comparison of the Howard-Dolman and Verhoeff size confusion tests of stereoscopic ability. Elek Ludvigh. [November 27, 1941.]
- M3** Stereo acuity testing on aviation pilot candidates [at the] Philadelphia Navy Yard. (n.a.) [1942.]
- M4** Posture and stereo acuity. Ross A. McFarland, Alfred H. Holway and others. Research Project No. 10. Harvard University. April 24, 1942.
- M5** The application of the Wulfeck group test of stereo acuity at Randolph and Kelly Fields, May 25 to 30, 1942. Samuel W. Fernberger. [May, 1942.]
- M6** The precision, consistency and accuracy of visual range observations. (Division 7 Report to the Services No. 25.) Ross A. McFarland, Alfred H. Holway and others. Research Project No. 10; OSRD No. 578. May 14, 1942.
- M7** An apparatus for measuring stereo and vernier acuity. (n.a.) Research Project No. 10. Harvard University. June 20, 1942.
- M8** Altered posture and stereo acuity. (n.a.) Research Project No. 10. Harvard University. June 20, 1942.
- M9** Startle, pupil size, stereo and vernier acuity. (n.a.) Research Project No. 10. Harvard University. June 20, 1942.
- M10** The effect of exercise on stereo and vernier acuity. (n.a.) Research Project No. 10. Harvard University. June 20, 1942.
- M11** The effects of metrazol on stereo and vernier acuity. (n.a.) Research Project No. 10. Harvard University. June 20, 1942.
- M12** Loss of sleep, benzedrine and stereo acuity. (n.a.) Research Project No. 10. Harvard University. June 20, 1942.
- M13** The effects of variations in blood sugar on stereo and vernier acuity. (n.a.) Research Project No. 10. Harvard University. June 20, 1942.
- M14** Low oxygen, low illumination, stereo and vernier acuity. (n.a.) Research Project No. 10. Harvard University. June 20, 1942.
- M15** The effects of hyperventilation on stereo and vernier acuity. (n.a.) Research Project No. 10. Harvard University. June 20, 1942.
- M16** Psychophysiological and psychophysical studies of stereo and vernier acuity. Ross A. McFarland, Alfred H. Holway and others. Research Project No. 10. Harvard University. June 20, 1942.
- M17** An investigation of the interval of time elapsing between the making of range and signal that range has been made. (n.a.) Research Project No. 10. [Harvard University] Howe Laboratory. June 22, 1942.
- M18** Stereo and vernier acuity as affected by metrazol, loss of sleep, benzedrine, variations in blood sugar and hyperventilation. (Division 7 Report to the Services No. 44.) (n.a.) Research Project No. 44. November 28, 1942.
- M19** Stereo acuity in relation to accommodation and vergence. (Report No. 6.) Glenn A. Fry, Charles

S. Bridgman and M. J. Allen. [OEMsr-637.] [Ohio State University.] August 18, 1943.

- M20** A stereo micrometer device for precision measurements of stereoscopic and vernier acuities. (Report No. 1.) Lorrin A. Riggs and Roberta M. Daley. OEMsr-1059. Brown University. August 30, 1943.
- M21** Stereoscopic acuity and telescopic vision. Alfred H. Holway and Dorothea A. Jameson. Harvard University. 1944.
- M22** Visual acuities in telescopic vision. Alfred H. Holway, Dorothea A. Jameson and others. OEMsr-555; Research Project No. 10. Harvard University. December 28, 1945.
- M23** A proposed group test of stereo acuity. (n.a.) (n.d.)

220.13 Dearborn Stereoscopic Testing

- M1** Reliability of the Dearborn instruments for testing stereoscopic vision. (n.a.) [OEMsr-555.] Harvard University. March 24, 1943.
- M2** Practice effect of the Dearborn instruments for testing stereoscopic vision. (n.a.) [OEMsr-555.] Harvard University. March 25, 1943.
- M3** The relation of Dearborn stereoscopic test scores to validation scores [of Class V₁] at Camp Davis. (n.a.) [OEMsr-555.] Harvard University. March 31, 1943.
- M4** The relation of Dearborn stereoscopic test scores to validation scores [of Class VI₁] at Camp Davis. (n.a.) [OEMsr-555.] Harvard University. March 31, 1943.
- M5** The administration and standardization of the Dearborn vectographic pursuit test. (n.a.) [OEMsr-555.] Harvard University. April 8, 1943.
- M6** Miscellaneous notes on the Dearborn tests of stereoscopic vision. (n.a.) [OEMsr-555.] Harvard University. Research Project No. 10. April 12, 1943.
- M7** The Dearborn-Johnston test for depth perception. (n.a.) Harvard University. (n.d.)
- M8** The Dearborn-Johnston test of stereoscopic vision. (n.a.) (n.d.)

220.14 Selection of Range Finder Operators

- M1** Knowledge-of-results training in ranging on a moving target. (n.a.) Research Project No. 10. Tufts College. April 22, 1942.
- M2** Tests of stereoscopic vision for the selection of range finder operators. Walter F. Dearborn, Philip W. Johnston and others. Research Project No. 10. Harvard University. May 1, 1942.
- M3** Description of instruments for use in the selection of stereoscopic range finder operators. (Division 7 Report to the Services No. 30.) Merrill M. Flood. NDCrc-186; OSRD No. 592. Princeton University. May 18, 1942.
- M4** Tests of stereoscopic vision for the selection of range finder operators. Report on work at Camp Davis. (n.a.) Research Project No. 10. Harvard University. June 26, 1942.
- M5** Tests of stereoscopic vision for the selection of range finder operators. The Wulfeck test. (n.a.)

Research Project No. 10. Harvard University. June 26, 1942.

- M6** Tests of stereoscopic vision for the selection of range finder operators. [Tests on Tufts University ROTC students.] (n.a.) Research Project No. 10. Harvard University. June 26, 1942.
- M7** Tests of stereoscopic vision for the selection of range finder operators. Experiment with 68th Coastal Artillery Group. (n.a.) Research Project No. 10. Harvard University. June 26, 1942.
- M8** Tests of stereoscopic vision for the selection of range finder operators. Recommendations as to use of Howard-Dolman apparatus. (n.a.) Research Project No. 10. Harvard University. June 26, 1942.
- M9** Manual for use in the selection of stereoscopic range finder operators. (Division 7 Report to the Services No. 31.) Merrill M. Flood. NDCrc-186; OSRD No. 721. Princeton University. July 7, 1942.
- M10** Learning rate and training program for stereoscopic range finder observers. (Division 7 Report to the Services No. 48.) Merrill M. Flood. NDCrc-186; OSRD No. 1203. Princeton University. February 15, 1943.
- M11** Supplement to: Manual for use in the selection of stereoscopic range finder operators. (Division 7 Report to the Services No. 49.) Merrill M. Flood. NDCrc-186; OSRD No. 1210. Princeton University. February 17, 1943.
- M12** Selection of stereoscopic range finder operators. (Division 7 Report to the Services No. 22.) (n.a.) (n.d.)

220.15 Scoring Systems and Comparisons of Scores

- M1** Intercorrelations of scores on the Bott test of stereopsis, the Navy Mark II stereo trainer and the Tufts stereo trainer. Leonard Carmichael, Bertram Wellman and others. [Research Project No. 10(?)] Tufts College. April 24, 1942.
- M2** The test-retest reliabilities of the Bott test of stereopsis, the Navy Mark II stereo trainer and the Tufts stereo trainer. Leonard Carmichael, Bertram Wellman and others. [Research Project No. 10(?)] Tufts College. April 24, 1942.
- M3** Intercorrelations between scores on the Tufts stereo trainer, the Navy stereo trainer, the Bott test of stereo acuity, the vectographic pursuit apparatus, the Wulfeck group test of stereo acuity and two tests of general intelligence. (n.a.) Research Project No. 10. Tufts College. June 18, 1942.
- M4** The test-retest reliability coefficients of the Tufts stereo trainer, the Navy stereo trainer, Mark II, and the Bott test of stereo acuity. (n.a.) Research Project No. 10. Tufts College. June 18, 1942.
- M5** Comparison of men and women subjects on the Tufts stereo trainer, the Navy stereo trainer, Mark II, and the Bott test of stereo acuity. (n.a.) Research Project No. 10. Tufts College. June 18, 1942.
- M6** The correlation between the Keystone and Bott

tests of stereopsis and influence of size of test stimuli in judgements of stereopsis. (n.a.) Research Project No. 10. Tufts College. June 18, 1942.

M7 A comparison of Wonderlic and Otis intelligence scores for submarine men and students. (Progress Report No. 1.) (n.a.) Research Project No. 44. Brown University. September 2, 1942.

M8 The validation of tests against the Navy marking system. Samuel W. Fernberger. September 22, 1942.

M9 Second report re: Validation of tests against the Navy scoring system. Samuel W. Fernberger. October 19, 1942.

M10 The relation of M-II and Dearborn-Johnston test scores to graduation standing at the Rangefield School, Navy Yard, Washington, D. C., January Class, 1942. (n.a.) [January, 1943(?)]

220.16 Fatigue and Motivation Factors

M1 [The effect of fatigue on binocular spatial localization.] (Progress Report Nos. 1 to 4.) Robert J. Beitel, Jr., Adelbert Ames and Hermann M. Burian. OEMsr-473. Dartmouth Eye Institute. May 16, 1942 to February 27, 1943.

M2 Fatigue tests. Continuous 13½-hours tracking fatigue test. (Report No. 2.) (n.a.) OEMsr-581. Tufts College. [February, 1943(?)]

M3 Fatigue tests. Three-day test of fatigue effects under conditions of long hours on duty, limited sleep. (Report No. 3.) (n.a.) OEMsr-581. Tufts College. [February, 1943(?)]

M4 Fatigue tests. Effect of sleep deprivation upon performance. (Report No. 4.) (n.a.) OEMsr-581. Tufts College. [February, 1943(?)]

M5 Fatigue tests. Motivation in the performance of routine military tasks. (Report No. 5.) (n.a.) OEMsr-581. Tufts College. [February, 1943(?)]

M6 Fatigue tests. Effect of a thirty-mile hike on stereo ranging, tracking and other tasks. (Report No. 6.) (n.a.) OEMsr-581. Tufts College. February, 1943.

M7 Fatigue tests. The effect of short period exercise on stereo ranging. (Report No. 7.) (n.a.) OEMsr-581. Tufts College. February, 1943.

M8 [The effect of fatigue on binocular spatial localization.] (Final report.) Robert J. Beitel, Jr., S. Howard Bartley and others. OEMsr-473. Dartmouth Eye Institute. February 27, 1943.

M9 Fatigue tests. The effect of diopter settings on stereo performance. (Report No. 8.) (n.a.) OEMsr-581. Tufts College. April 24, 1943.

M10 Research on fatigue in service jobs. (Summary Report for August 1, 1942 to July 1, 1943.) Leonard C. Mead. OEMsr-581; OSRD No. 1592. Tufts College. June 30, 1943.

M11 The performance of trained subjects on a complex task of four hours duration. (Memorandum No. 1.) Arthur C. Hoffman and Leonard C. Mead. OEMsr-581; OSRD No. 1701. Tufts College. July 24, 1943.

M12 The effects of motivation and of fatigue on stereo-

scopic ranging and direct tracking. (Division 7 Report to the Services No. 56.) (n.a.) OSRD No. 1478. Tufts College. (n.d.)

220.17 Effects of Interrupted Operation

M1 Retention of stereoscopic ability in the absence of practice. (n.a.) Research Project No. 10. [Harvard University] Howe Laboratory. June 23, 1942.

M2 The effect of a two-week layoff after training on stereo performance. (n.a.) OEMsr-66; Research Project No. 10. Tufts College. July 15, 1942.

220.18 Effects of Sound on Operation

M1 Bell pacing on a moving target. (n.a.) Research Project No. 10. Tufts College. April 18, 1942.

M2 Fatigue tests. The effects of sound on accuracy of azimuth tracking. (Report No. 1.) (n.a.) OEMsr-581. Tufts College. September 18, 1942.

M3 The effect of loud sounds on the ability of an observer to maintain continuous stereoscopic contact as in range finding. (Progress Report No. 6.) (n.a.) Research Project No. 44. Brown University. October 14, 1942.

M4 The effects of loud sounds on the accuracy of azimuth tracking and of stereoscopic range finding. (Division 7 Report to the Services No. 37.) (n.a.) November 27, 1942.

220.19 Miscellaneous Tests

M1 The target position effect on constant error in the Tufts trainer and in the Navy trainer, Mark II, Model II. (n.a.) Research Project No. 10. Tufts College. April 20, 1942.

M2 The effect of the inter-eyepiece distance setting in the Navy and Tufts trainers on constant error. An apparatus for the accurate and reliable measurement of inter-eyepiece distance. (n.a.) Research Project No. 10. Tufts College. April 20, 1942.

M3 The dependence of cyclophoria on eye and head position. (Report No. 7.) Glenn A. Fry, Charles S. Bridgman and M. J. Allen. [OEMsr-637.] [Ohio State University.] August 25, 1943.

M4 Speed and accuracy in spotting with a height finder. (Report No. 9.) Glenn A. Fry, Charles S. Bridgman and others. [OEMsr-637.] [Ohio State University.] September 15, 1943.

220.2 Training

M1 An investigation of the amount of practice advisable in ranging on a simulated diving aeroplane target. (n.a.) Research Project No. 10. [Harvard University] Howe Laboratory. June 22, 1942.

220.21 Instruments

220.211 Tufts Trainer

M1 The Tufts trainer. (n.a.) Research Project No. 10. Tufts College. April 14, 1942.

M2 Constant error and variability in the Tufts trainer as influenced by techniques of bracketing on a stationary target. (n.a.) Research Project No. 10. Tufts College. April 16, 1942.

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- M3** High impedance direct-reading vacuum tube voltmeter for DC. (n.a.) Research Project No. 10. Tufts College. July, 1942.
- M4** Description of the Tufts tracking trainer. (Report No. 11.) Bradford B. Hudson and Lloyd V. Searle. OEMsr-581; Research Project No. SOS-6; OSRD No. 3286. Tufts College. February 5, 1944.
- 220.212 Mark II Navy Stereo Trainer.**
- M1** Experiments determining the effect of the relative position of target and reticule on dial readings in a Mark II stereoscopic training instrument. (n.a.) (n.d.)
- M2** Experiments comparing results obtained with a Mark II stereoscopic training instrument and those obtained in free space. (n.a.) (n.d.)
- 220.213 Miscellaneous Instruments**
- M1** A comparison of the accuracy of stereo ranging on targets of different types. (n.a.) Research Project No. 10. [Harvard University] Howe Laboratory. June 23, 1942.
- M2** Specifications for proposed M-4 range finder trainer for US Army. (n.a.) [OEMsr-56.] Eastman Kodak Company. July 7, 1942.
- M3** Analysis of factors effective in the use of the stereoscopic range and height finder. (Division 7 Report to the Services No. 32.) (n.a.) OSRD No. 869. September 9, 1942.
- M4** The Brown stereoscopic trainer. (Progress Report No. 4.) (n.a.) Research Project No. 44. Brown University. September 23, 1942.
- M5** The Eastman trainer for range finder observers. (Division 7 Report to the Services No. 39.) (n.a.) OEMsr-56 and NDCrc-186. Eastman Kodak Company and Princeton University. October 17, 1942.
- 220.3 Optical Tracking**
- 220.31 Handwheel Control**
- M1** Inertia, friction and diameter in handwheel tracking. (Report No. 4.) (n.a.) OEMsr-453. Foxboro Company. September 15, 1943.
- M2** Preliminary investigation of tandem tracking. (Memorandum No. 24.) (n.a.) OEMsr-453. Foxboro Company. June 28, 1945.
- 220.311 Accuracy**
- M1** A study of factors determining accuracy of tracking by means of handwheel control. (Division 7 Report to the Services No. 71.) (n.a.) OEMsr-453; OSRD No. 3451. Foxboro Company. September 30, 1942.
- M2** A supplemental study of factors determining accuracy of tracking by means of handwheel control. (Division 7 Report to the Services No. 72.) (n.a.) OEMsr-453; OSRD No. 3452. Foxboro Company. December 7, 1942.
- M3** Handwheel speed and accuracy of tracking. (Division 7 Report to the Services No. 73.) (n.a.) OEMsr-453; OSRD No. 3453. Foxboro Company. May 12, 1943.
- M4** Relative accuracy of handwheel tracking with one and both hands. (Division 7 Report to the Services No. 75.) (n.a.) OEMsr-453. Foxboro Company. November 20, 1943.
- M5** Effects of target speeds and rates of turning on accuracy of direct handwheel tracking. (Memorandum No. 13.) (n.a.) OEMsr-453. Foxboro Company. July 6, 1944.
- 220.312 Magnification**
- M1** Improvement in direct, aided and velocity tracking through magnification of data presentation. (Memorandum No. 14.) (n.a.) OEMsr-453. Foxboro Company. August 24, 1944.
- M2** Influence of visual magnification on accuracy of tracking. (Division 7 Report to the Services No. 90.) (n.a.) OEMsr-453. Foxboro Company. April 5, 1945.
- 220.32 Slewing and Central Tracking**
- M1** Comparative studies of slewing and central tracking with a variety of types of machine gun sights. (Division 7 Report to the Services No. 88.) (n.a.) OEMsr-453. Foxboro Company. January, 1945.
- M2** Studies in lead tracking with machine gun sights. (Division 7 Report to the Services No. 92.) (n.a.) OEMsr-453. Foxboro Company. June, 1945.
- 220.33 Hand and Foot Control**
- M1** Simultaneous hand and foot operation of tracking and ranging controls. (Memorandum No. 12.) (n.a.) OEMsr-453. Foxboro Company. June 27, 1944.
- M2** Simultaneous tracking and ranging with hands and feet versus all hand control. (Memorandum No. 15.) (n.a.) OEMsr-453. Foxboro Company. September 15, 1944.
- M3** Single versus double-pedal ranging while handlebar tracking. (Memorandum No. 16.) (n.a.) OEMsr-453. Foxboro Company. October 20, 1944.
- M4** Studies of direct tracking and simultaneous stadiametric ranging. (Division 7 Report to the Services No. 87.) (n.a.) December, 1944.
- 220.34 Miscellaneous Optical Tracking Problems**
- M1** Relative effectiveness of make-and-break and continuous tracking in range at various rates of change of angular disparateness. (n.a.) Research Project No. 10. [Harvard University] Howe Laboratory. June 22, 1942.
- M2** Sex differences in stereoscopic ranging and in visual tracking. (Division 7 Report to the Services No. 52.) (n.a.) February 23, 1943.
- M3** A study of antiaircraft tracking. (Final report.) John V. Atanasoff, Harold V. Gaskill and others. OEMsr-165. Iowa State College. (n.d.)
- M4** A study of antiaircraft tracking. (Supplement to final report.) John V. Atanasoff, Harold V. Gaskill and others. OEMsr-165. Iowa State College. (n.d.)
- M5** A study of antiaircraft tracking. (Supplementary

Report No. II.) John V. Atanasoff, Harold V. Gaskill and Sam Legvold. OEMsr-165. Iowa State College. (n.d.)

230 Vision Problems

230.1 Chromatic Dispersion

- M1** The chromatic dispersion of the human eye and its possible influence on stereoscopic range finding. (Division 7 Report to the Services No. 35.) (n.a.) OEMsr-637; Research Project No. 10; OSRD No. 923. Ohio State University. October 1, 1942.
- M2** The relation of chromatic aberration and dispersion of the eye to the blurredness of an object seen through the M-1 height finder. Glenn A. Fry, Charles S. Bridgman and others. [OEMsr-637.] [Ohio State University.] July 1, 1943.
- M3** Means for measuring and compensating chromastereopsis with special reference to the use of the M-1 height finder. Glenn A. Fry, Charles S. Bridgman and others. [OEMsr-637.] [Ohio State University.] September 20, 1943.

230.2 Ocular Research

- M1** Measures of interpupillary distance. (Progress Report No. 20.) Lorrin A. Riggs, Roberta M. Daley and F. A. Mote. OEMsr-1059. Brown University. October 16, 1944.
- M2** An investigation of possible effects attributable to torsion in stereoscopic performance. (Progress Report No. 24.) Clarence H. Graham, Lorrin A. Riggs and others. OEMsr-1059. Brown University. December 5, 1944.

230.21 Binocular Vergence

- M1** Apparent distance. Binocular vergence and target size. (n.a.) [OEMsr-555.] Research Project No. 10. Harvard University. June 20, 1942.
- M2** The limits of binocular fusion. Binocular vergence. (n.a.) [OEMsr-555.] Research Project No. 10. Harvard University. June 20, 1942.
- M3** The limits of binocular fusion. Target size. (n.a.) [OEMsr-555.] Research Project No. 10. Harvard University. June 20, 1942.
- M4** Apparent size and binocular vergence. (n.a.) [OEMsr-555.] Research Project No. 10. Harvard University. June 20, 1942.

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310 Computing Machines

311 Theory

- M1** Some experimental results on the deflection mechanism. Claude E. Shannon. [Princeton University.] June 26, 1941.
- M2** The theory and design of linear differential equation machines. (Division 7 Report to the Services No. 20.) Claude E. Shannon. Bell Telephone Laboratories, Inc. January, 1942.

- M3** Backlash in overdamped systems. Claude E. Shannon. (n.d.)

312 Types

312.1 Relay Interpolators

- M1** A statement concerning the future availability of a new computing device. (AMP Note No. 7.) George R. Stibitz. Applied Mathematics Panel. November, 1943.
- M2** Relay computers. (AMP Report No. 171.1R.) George R. Stibitz. Applied Mathematics Panel. February, 1945.
- M3** A talk on relay computers. (AMP Memorandum No. 171.1M.) George R. Stibitz. Applied Mathematics Panel. March, 1945.
- M4** Relay interpolator. S. B. Williams. OEMsr-1160. Bell Telephone Laboratories, Inc. October 31, 1945.

312.2 Tape Recorders

- M1** Instruction book [for the] data recording system. (Issue 3, Book 4.) (n.a.) OEMsr-965. Bell Telephone Laboratories, Inc. October 21, 1944.
- M2** Instruction manual [for the] tape dynamic tester, Model 1, for testing antiaircraft directors and computers. (n.a.) OEMsr-904. Bell Telephone Laboratories, Inc. November 30, 1944.

312.3 Slide Rule

- M1** Stibitz computing machine, Model B, designed and built by Department of Physics [of the] University of North Carolina. R. R. Monroe. OEMsr-767. University of North Carolina. (n.d.)

313 Smoothing and Smoothers

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- M5** A comparison of cyclitol, pentolite and ednatol. (Progress Report to April 1, 1943.) Eugene H. Eyster and M. A. Paul. OEMsr-202; Service Project No. OD-01; OSRD No. 1364. Carnegie Institute of Technology. April 24, 1943.
- M6** PEP-2, PETN plastic explosive. Eugene H. Eyster and M. A. Paul. OEMsr-202; Service Project No. OD-04; OSRD No. 3240. Carnegie Institute of Technology. February 11, 1944.
- M7** Studies on the stability of PETN and pentolite. Stewart D. Brewer. OEMsr-202; Service Project No. OD-58; OSRD No. 3983. Carnegie Institute of Technology. August 8, 1944.
- M8** The gas evolution from torpex. F. H. Westheimer and John W. Dawson. OEMsr-202; Service Project Nos. OD-01, OD-04 and NO-231; OSRD No. 4085. Carnegie Institute of Technology. September 1, 1944.
- M9** The preparation and properties of plastic high explosives. Eugene H. Eyster. OEMsr-202; Service Project Nos. OD-04; OSRD No. 5631. Carnegie Institute of Technology. January 15, 1946.

110 Laboratory Experimentation

- M1** Organic development problems. (Interim Report Nos. ODP-1 to ODP-17 [covering the period from, November 15, 1942 to April 15, 1944.] Compiled by: George B. Kistiakowsky and Howard J. Fisher. Service Project Nos. OD-68, NO-117 and others.
- M2** Development of inert materials to simulate explosives. (Final report.) J. B. Tepe. OEMsr-1467; Service Project No. NO-231; OSRD No. 6362. E. I. duPont de Nemours and Company, Inc. December 4, 1945.

110.1 Nitration

- M1** Preparation and reactions of nitroform. (Progress Report No. 82, to September 15, 1941.) Charles D. Hurd. NDCrc-7; Service Project No. OD-11; OSRD No. 144. Northwestern University. September 20, 1941.
- M2** The reactions of xylene with aluminum chloride. (Progress Report No. 163.) Lee Irvin Smith. NDCrc-17; Service Project No. OD-10; OSRD No. 333. University of Minnesota. January 20, 1942.
- M3** The nitration of furans. (Final Report No. 172, to May 1, 1941.) Henry Gilman. NDCrc-19; Service Project No. OD-1; OSRD No. 350. Iowa State College. January 28, 1942.
- M4** Nitration of melamine. (Progress Report No. 173, to January 1, 1942.) Frank C. Whitmore. NDCrc-66; Service Project No. OD-12; OSRD No. 351. Pennsylvania State College. January 29, 1942.
- M5** The addition of oxides of nitrogen to ethylene. (Progress Report to March 15, 1943.) Kenneth N. Campbell and Richard S. Towne. OEMsr-669; Service Project No. OD-68; OSRD No. 1335. University of Notre Dame. April 9, 1943.
- M6** The addition of oxides of nitrogen to ethylene. (Progress Report to September 15, 1943.) Kenneth N. Campbell. OEMsr-669; Service Project No. OD-68; OSRD No. 1891. University of Notre Dame. October 6, 1943.
- M7** The oxynitration reaction. (Progress Report to January 13, 1944.) F. H. Westheimer. OEMsr-875; Service Project No. NO-117; OSRD No. 3154. University of Chicago. January 19, 1944.

110.11 Polynitrates

- M1** Preparation of polynitronaphthalenes. (Final Report No. 53.) T. L. Davis. NDCrc-12; Service Project No. OD-13; OSRD No. 115. Massachusetts Institute of Technology. June 27, 1941.
- M2** Preparation of trinitrobenzene from benzene via picryl chloride. (Progress Report No. 141.) Roger Adams and C. S. Marvel. OEMsr-48; Service Project No. OD-5; OSRD No. 312. University of Illinois. December 15, 1941.
- M3** The preparation of tetranitromethane. (Progress Report No. 164.) Charles D. Hurd. NDCrc-7; Service Project No. OD-11; OSRD No. 334. Northwestern University. January 20, 1942.

110.12 Phenols

- M1** The nitration of benzene and toluene in the absence of sulfuric acid according to a process submitted by the Autoxygen Company. Robert C. Elderfield. OEMsr-137; Service Project No. OD-9; OSRD No. 1192. Columbia University. February 11, 1943.
- M2** The kinetics of the nitration of phenols. (Final report.) F. H. Westheimer, J. E. Bloom and others. OEMsr-875; Service Project No. NO-117; OSRD No. 4024. University of Chicago. October 9, 1944.
- M3** The oxynitration of benzene to 2-, 4-dinitrophenol. Werner E. Bachmann. OEMsr-245; Service Project

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No. NO-117; OSRD No. 4026. University of Michigan. February 28, 1945.

- M4** The oxynitration of benzene to nitrophenols. Marvin Carmack. OEMsr-646; Service Project No. NO-117; OSRD No. 4025. University of Pennsylvania. October 5, 1945.

110.13 Kinetic Studies

- M1** The kinetics of nitration. (Final Report No. 146, to October 1, 1941.) Morris S. Kharasch and F. H. Westheimer. NDCrc-4; Service Project No. OD-9; OSRD No. 295. University of Chicago. December 29, 1941.
- M2** Kinetics of nitration. Preparation of trinitroethylbenzene. (Progress Report No. 147, to October 1, 1941.) Morris S. Kharasch and F. H. Westheimer. NDCrc-4; Service Project No. OD-9; OSRD No. 285. University of Chicago. December 29, 1941.
- M3** Kinetic studies on the nitration process. (Progress Report to September 30, 1942.) Robert C. Elderfield and Louis P. Hammett. OEMsr-305; Service Project No. OD-9; OSRD No. 1154. Columbia University. January 25, 1943.
- M4** Kinetics of decomposition of various explosives. Hyman Henkin. OEMsr-202; Service Project Nos. OD-01 and OD-04; OSRD No. 3856. Carnegie Institute of Technology. July 4, 1944.

110.2 Alcohols, Complex

- M1** The preparation of anhydroenneaheptitol. (Final Report No. 83, to September 15, 1941.) M. L. Wolfrom. NDCrc-43; Service Project No. OD-04; OSRD No. 145. Ohio State University. October 4, 1941.
- M2** The tetritols. A literature survey. (Final Report No. 84, to September 15, 1941.) M. L. Wolfrom. NDCrc-43; Service Project No. OD-4; OSRD No. 146. Ohio State University. October 6, 1941.
- M3** The preparation of sugar alcohols and glycosides for nitration studies. (Final Report No. 85, to September 15, 1941.) M. L. Wolfrom. NDCrc-43; Service Project No. OD-4; OSRD No. 147. Ohio State University. October 7, 1941.
- M4** Preparation of pentaerythritol. (Final Report No. 86, to August 13, 1941.) M. L. Wolfrom. NDCrc-43; Service Project No. OD-4; OSRD No. 148. Ohio State University. October 7, 1941.
- M5** The preparation of pentaerythritol. (Progress Report to September 1, 1943.) Robert C. Elderfield. OEMsr-224; Service Project No. OD-58; OSRD No. 1804. Columbia University. September 16, 1943.

110.3 Crystallography

- M1** Microscopic examination of high explosives and boosters. Alfred T. Blomquist. OEMsr-193; Service Project No. OD-109; OSRD No. 3014. Cornell University. August 1, 1941.
- M2** Crystallographic studies of RDX, HMX and related compounds. (Progress Report No. 289, to June 30, 1942.) John R. Johnson. OEMsr-193; Service Proj-

ect No. OD-12; OSRD No. 694. Cornell University. July 15, 1942.

- M3** The 32° transition of ammonium nitrate. (Progress Report to June 15, 1943.) J. F. Kincaid and R. C. St. George. OEMsr-202; Service Project Nos. OD-05 and OD-14; OSRD No. 1577. Carnegie Institute of Technology. July 7, 1943.
- M4** Crystallographic studies of compounds related to RDX and HMX. (Progress Report to August 31, 1943.) Alfred T. Blomquist. OEMsr-193; Service Project No. OD-12; OSRD No. 1803. Cornell University. September 16, 1943.
- M5** The crystallography of haleite. (Final Report to November 15, 1943.) Alfred T. Blomquist. OEMsr-193; Service Project No. OD-68; OSRD No. 2055. Cornell University. November 25, 1943.

110.4 Miscellaneous Experimental Research

- M1** Preparation of aminoguanidine sulfate. (Progress Report No. 76, to August 1, 1941.) G. B. L. Smith. NDCrc-22; Service Project No. OD-3; OSRD No. 138. Polytechnic Institute of Brooklyn. September 17, 1941.
- M2** A study of recovery of acetic acid and ammonium nitrate from the Bachmann process. (Progress Report No. 182, to February 1, 1942.) Frank C. Whitmore. NDCrc-8; Service Project No. OD-12; OSRD No. 393. Pennsylvania State College. February 17, 1942.
- M3** An apparatus for the determination of particle size. (Final report.) F. A. Long. Service Project No. OD-04; OSRD No. 590. May 15, 1942.
- M4** The potentiometric titration of filtrates from the Bachmann process. (Progress Report No. 276, to June 22, 1942.) Frank C. Whitmore. OEMsr-243; Service Project No. OD-12; OSRD No. 654. Pennsylvania State College. June 23, 1942.
- M5** Determination of water in RDX and Composition B. (Progress Report to January 1, 1943.) Eugene H. Eyster and M. A. Paul. OEMsr-202; Service Project No. OD-01; OSRD No. 1234. Carnegie Institute of Technology. March 2, 1943.
- M6** Color tests for high explosives. Ralph L. Shriner. OEMsr-701; Service Project No. OD-01; OSRD No. 5397. Indiana University. August 4, 1945.
- M7** A chromatographic investigation of the impurities in certain samples of commercial RDX. Earl W. Malmberg. OEMsr-881; Service Project No. OD-12; OSRD No. 5944. California Institute of Technology. November 13, 1945.

200 HIGH EXPLOSIVES, PROPERTIES OF

- M1** Methods of physical testing. (Progress Report No. 307, to August 1, 1942.) Duncan P. MacDougall. OEMsr-202; Service Project No. OD-01; OSRD No. 804. Carnegie Institute of Technology. August 11, 1942.
- M2** Compilation of data on organic explosives. (Final report.) A. H. Blatt. OEMsr-741; Service Project Nos. NO-B10 and OD-01; OSRD No. 2014. Queens College. February 29, 1944.

201 Stability

- M1** Chemical tests for new explosives. (Progress Report No. 305, to July 1, 1942.) Russell McGill. OEMsr-202; Service Project No. OD-01; OSRD No. 787. Carnegie Institute of Technology. August 11, 1942.
- M2** Evaluation of explosives submitted to the Explosives Research Laboratory in 1941. (Progress Report No. 329.) Russell McGill and Saul Soloway. OEMsr-202; Service Project No. OD-01; OSRD No. 830. Carnegie Institute of Technology. August 25, 1942.
- M3** The stability of PETN and pentolite. (Progress Report to April 1, 1943.) Stewart D. Brewer and Hyman Henkin. OEMsr-202; Service Project No. OD-58; OSRD No. 1414. Carnegie Institute of Technology. May 14, 1943.
- M4** Surveillance testing of high explosives. (Progress Report to July 15, 1943.) Hyman Henkin. OEMsr-202; Service Project Nos. OD-01 and OD-04; OSRD No. 1947. Carnegie Institute of Technology. October 23, 1943.
- M5** Methods of stability testing. (Report as of January 1, 1944.) Hyman Henkin. OEMsr-202; Service Project Nos. OD-01 and OD-04; OSRD No. 3401. Carnegie Institute of Technology. March 22, 1944.
- M6** Studies related to the stability of PETN. (Progress Report to February 29, 1944.) Alfred T. Blomquist and James F. Ryan, Jr. OEMsr-193; Service Project No. OD-58; OSRD No. 3566. Cornell University. May 3, 1944.

202 Sensitivity

- M1** The effect of mechanical stresses on high explosives. (Report No. 1.) Percy W. Bridgman. OSRD No. 64. Harvard University. December 19, 1940.
- M2** The sensitivity of RDX, HMX and RDX-HMX mixtures. (Report No. 317, to July 30, 1942.) John R. Johnson. Service Project No. OD-12; OSRD No. 797. August 12, 1942.
- M3** Sensitiveness of high explosives. (Progress Report to March 1, 1943.) J. G. Fox, W. S. Koski and R. W. Lawrence. OEMsr-719; Service Project No. OD-01; OSRD No. 1288. Hercules Powder Company. March 23, 1943.
- M4** Sensitivity of explosives to projectile impact. Eugene H. Eyster, George B. Kistiakowsky and others. OSRD No. 3156. January 1, 1944.
- M5** A method of measuring the sensitiveness of high explosives to frictional impact. J. G. Fox. OEMsr-719; Service Project No. OD-01; OSRD No. 3185. Hercules Powder Company. January 27, 1944.
- M6** Sensitiveness of high explosives. (Part II.) J. G. Fox, W. S. Koski and others. OEMsr-719; Service Project No. OD-01; OSRD No. 3991. Hercules Powder Company. August 9, 1944.
- M7** Sensitiveness of high explosives. (Part III.) J. G. Fox, W. S. Koski and others. OEMsr-719; Service Project No. OD-01; OSRD No. 4962. Hercules Powder Company. April 21, 1945.
- M8** The sensitivity of various general purpose bombs

and simulated rocket motors to projectile impact. William H. Rogers, Jr. and Eugene H. Eyster. OEMsr-202; Service Project Nos. OD-04, NO-231 and NO-232; OSRD No. 5024. Carnegie Institute of Technology. May 2, 1945.

- M9** Physical testing of explosives. Part I, The sensitivity of explosives to bullet impact. Eugene H. Eyster and William H. Rogers, Jr. OEMsr-202; Service Project Nos. NO-290, OD-01 and NO-231; OSRD No. 5745. Carnegie Institute of Technology. November 20, 1945.
- M10** Physical testing of explosives. Part II, Sensitivity studies with the drop-weight impact machine. Eugene H. Eyster and R. F. Davis. OEMsr-202; Service Project Nos. OD-01 and NO-290; OSRD No. 5744. Carnegie Institute of Technology. December 27, 1945.
- M11** Physical testing of explosives. Part III, Miscellaneous sensitivity tests. Performance tests. L. C. Smith and Eugene H. Eyster. OEMsr-202; Service Project Nos. OD-01 and NO-290; OSRD No. 5746. Carnegie Institute of Technology. December 27, 1945.
- M12** Studies of the desensitization of torpex-2 and of the sensitivity of HBX. Eugene H. Eyster. OEMsr-202; Service Project No. NO-232; OSRD No. 5743. Carnegie Institute of Technology. January 2, 1946.
- M13** The sensitivity to bullet impact of aerial depth bombs loaded with TNT and with various HBX's. William H. Rogers, Jr. and Eugene H. Eyster. OEMsr-202; Service Project No. NO-232; OSRD No. 5748. Carnegie Institute of Technology. January 15, 1946.
- M14** Sensitiveness of high explosives. (Fourth Formal Progress Report.) J. M. Downard, J. G. Fox and others. OEMsr-719; Service Project Nos. OD-01 and NO-290; OSRD No. 5632. Hercules Powder Company. January 17, 1946.
- M15** Bullet impact tests of demolition packs and reinforced detonating cord. William H. Rogers, Jr. OEMsr-202; Service Project Nos. NO-290 and OD-01; OSRD No. 5747. Carnegie Institute of Technology. January 18, 1946.
- M16** High desensitized cast explosives. Eugene H. Eyster. OEMsr-202; Service Project Nos. NO-232 and NO-290; OSRD No. 5628. Carnegie Institute of Technology. January 22, 1946.
- M17** Sensitiveness of high explosives. (Fifth Formal Progress Report.) J. M. Downard. OEMsr-719; Service Project Nos. OD-01 and NO-290; OSRD No. 6627. Hercules Powder Company. February 28, 1946.
- M18** Sensitiveness of high explosives. (Final Report.) J. M. Downard and R. W. Lawrence. OEMsr-719; Service Project Nos. OD-01 and NO-290; OSRD No. 6629. Hercules Powder Company. March 30, 1946.

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Thermal Reactions

- M1** Investigation of the melting point of RDX. (Progress Report No. 233, to April 20, 1942.) Frank C. Whitmore. OEMsr-243; Service Project No. OD-12;

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- OSRD No. 538. Pennsylvania State College. April 30, 1942.
- M2** Studies on the heat phenomena observed in the preparation of RDX by the Bachmann process. (Progress Report No. 458, to December 3, 1942.) Frank C. Whitmore, J. G. Aston and others. OEMsr-243; Service Project No. OD-12; OSRD No. 1134. Pennsylvania State College. December 8, 1942.
- M3** Intermediate burning products of nitrocellulose. M. L. Wolfrom and Robert C. Elderfield. OEMsr-1152 and OEMsr-137; Service Project No. OD-126; OSRD No. 3568. Ohio State University and Columbia University. May 3, 1944.
- 203.1 Gas Evolution**
- M1** The gas evolution from TNT-aluminum. Amos Turk. OEMsr-202; Service Project Nos. OD-01, OD-04 and NO-231; OSRD No. 4339. Carnegie Institute of Technology. November 14, 1944.
- M2** The gas evolution from DBX. Amos Turk and Earl Hellerstein. OEMsr-202; Service Project Nos. OD-01, OD-04 and NO-231; OSRD No. 4715. Carnegie Institute of Technology. February 19, 1945.
- M3** The gas evolution from minol. John W. Dawson and F. H. Westheimer. OEMsr-202; Service Project Nos. OD-01, OD-04 and NO-231; OSRD No. 5595. Carnegie Institute of Technology. November 8, 1945.
- 203.2 Combustion, Heats of**
- M1** Determinations of the heats of combustion of explosives. (Progress Report No. 148, to December 15, 1941.) George B. Kistiakowsky and W. S. McEwan. NDCrc-46; Service Project No. OD-01; OSRD No. 293. Harvard University. December 29, 1941.
- M2** The heats of combustion of explosives. (Progress Report No. 288, to July 1, 1942.) George B. Kistiakowsky and W. S. McEwan. NDCrc-46; Service Project No. OD-01; OSRD No. 702. Harvard University. July 15, 1942.
- M3** Determination of explosion temperatures. (Progress Report to October 25, 1943.) Hyman Henkin. OEMsr-202; Service Project Nos. OD-01 and OD-04; OSRD No. 1986. Carnegie Institute of Technology. November 4, 1943.
- M4** The effect of heat on confined explosives. [Part] I, The M-35 five-inch projectile. [Part] II, Various pure explosives and explosive mixtures. H. A. Strecker and E. C. Broge. OEMsr-202; Service Project No. NO-201; OSRD No. 3956. Carnegie Institute of Technology. July 28, 1944.
- M5** Heat of combustion of explosive substances. (Final report.) Gebhard Stegeman. OEMsr-754; Service Project No. OD-01; OSRD No. 5306. University of Pittsburgh. July 4, 1945.
- 300 HIGH EXPLOSIVES, APPLICATION OF**
- 301 Antiaircraft Bursts**
- M1** Increased visibility of antiaircraft shell bursts. (Progress Report No. 190, to February 15, 1942.) Duncan P. MacDougall. OEMsr-202; Service Project No. OD-31; OSRD No. 412. Carnegie Institute of Technology. February 25, 1942.
- M2** Increased visibility of antiaircraft shell bursts. (Final Report No. 239.) Duncan P. MacDougall. OEMsr-202; Service Project No. OD-31; OSRD No. 559. Carnegie Institute of Technology. May 8, 1942.
- M3** Fragment velocity and fragmentation of 3"/50 EX-2 (Mark 27, Model 3) antiaircraft shell loaded with TNT and with Composition A-3 and cavitized for Mark 45 fuze. R. W. Drake. OEMsr-202; Service Project Nos. NO-110, NO-167 and OD-152; OSRD No. 5267. Carnegie Institute of Technology. June 27, 1945.
- M4** Fragment velocity and fragmentation of 3"/50 (Mark 27, Model 3) antiaircraft shell loaded with TNT and with Composition A-3 and cavitized for Mark 54 aux. det. R. W. Drake. OEMsr-202; Service Project Nos. NO-110, NO-167 and OD-152; OSRD No. 5531. Carnegie Institute of Technology. September 4, 1945.
- 302 Streamers, Explosive**
- M1** Mark 29 device. (Interim Report Nos. M29-1 to M29-9 [covering the period from] November 15, 1942 to October 15, 1943.) Compiled by: George B. Kistiakowsky. Service Project No. NS-125.
- M2** The design of explosive streamers. (Progress Report to April 15, 1943.) J. H. Lum and J. K. Bragg. OEMsr-202; Service Project No. NS-125; OSRD No. 1382. Carnegie Institute of Technology. May 5, 1943.
- M3** Development of linear charges. Final report on Mark 29 device. (n.a.) OEMsr-828; Service Project No. NS-125; OSRD No. 3781. E. I. duPont de Nemours and Company, Inc. June 15, 1944.
- 303 Microwave Tube Destruction**
- M1** Microwave tube destruction. (Progress Report No. 460, to December 1, 1942.) Duncan P. MacDougall. OEMsr-202; Service Project No. SC-41; OSRD No. 1122. Carnegie Institute of Technology. December 9, 1942.
- M2** Microwave tube destruction. (Progress Report to March 10, 1943.) M. A. Paul. OEMsr-202; Service Project No. SC-41; OSRD No. 1287. Carnegie Institute of Technology. March 23, 1943.
- M3** Microwave tube destruction. (Final report.) M. A. Paul. OEMsr-202; Service Project No. SC-41; OSRD No. 1723. Carnegie Institute of Technology. August 20, 1943.
- 304 Liquid Explosives**
- M1** Properties of liquid explosives. (Report No. L-1.) C. O. Davis and Howard J. Fisher. Service Project No. CE-32. December 16, 1944.
- M2** Liquid explosives. (Final report.) L. A. Burrows. OEMsr-828; Service Project No. CE-32; OSRD No.

4815. E. I. duPont de Nemours and Company, Inc. March 31, 1945.

M3 Liquid explosives for mine clearing. (Report No. L-2.) Howard J. Fisher. Service Project No. CE-32. May 17, 1945.

M4 Initiation, propagation and luminosity studies of liquid explosives. H. A. Strecker. OEMsr-202; Service Project Nos. OD-04, NO-291 and CE-32; OSRD No. 5609. Carnegie Institute of Technology. December 3, 1945.

M5 Development and testing of liquid explosives for mine clearing. Howard J. Fisher. OEMsr-202; Service Project No. CE-32; OSRD No. 5749. Carnegie Institute of Technology. January 28, 1946.

400 **EXPLOSIVE PHENOMENA, EXPERIMENTAL STUDY OF**

M1 Fundamental study of explosives. (Interim Report Nos. FS-1 to FS-12 [covering period from] August 15, 1942 to August 15, 1943.) Compiled by: George B. Kistiakowsky. Service Project Nos. OD-02, OD-03 and others.

M2 Experimental studies of cone collapse and jet formation. Part I, Recovery of cones from low powered charges. H. Linschitz and M. A. Paul. OEMsr-202; Service Project No. AN-1; OSRD No. 2070. Carnegie Institute of Technology. November 29, 1943.

M3 Experimental studies of cone collapse and jet formation. Part II, The mass contributed to the jet. M. A. Paul and H. Linschitz. OEMsr-202; Service Project No. AN-1; OSRD No. 2072. Carnegie Institute of Technology. November 29, 1943.

M4 Radiography of explosive materials. O. E. A. Bolduan. OEMsr-202; Service Project Nos. OD-01 and NO-290; OSRD No. 5575. Carnegie Institute of Technology. November 5, 1945.

M5 Experimental studies of cone collapse and jet formation. Part III, Further studies of jet mass origin and slug structure. M. A. Paul. OEMsr-202; Service Project No. AN-1; OSRD No. 5602. [Carnegie Institute of Technology.] December 20, 1945.

401 **Detonation, Flash Photography of**

M1 A rotating-drum camera for the optical study of detonations. (Progress Report No. 285.) Duncan P. MacDougall and G. H. Messerly. OEMsr-202; Service Project No. OD-04; OSRD No. 682. Carnegie Institute of Technology. July 8, 1942.

M2 The flash photography of detonating explosives. (Progress Report to May 1, 1943.) G. H. Messerly. OEMsr-202; Service Project No. OD-02; OSRD No. 1488. Carnegie Institute of Technology. June 3, 1943.

M3 The use of the rotating-drum camera for the measurement of the velocities of shell or bomb fragments. G. H. Messerly. OEMsr-202; Service Project Nos. NO-110, NO-167 and OD-152; OSRD No. 3900. Carnegie Institute of Technology. July 15, 1944.

M4 Construction and operation of the rotating-mirror camera. S. J. Jacobs. OEMsr-202; Service Project

Nos. NO-291 and OD-04; OSRD No. 5614. Carnegie Institute of Technology. January 2, 1946.

M5 Studies of shaped charges with the rotating-drum camera. M. D. Hurwitz and H. A. Strecker. OEMsr-202; Service Project No. AN-1; OSRD No. 5615. Carnegie Institute of Technology. January 15, 1946.

M6 Studies pertaining to measurement of temperature. T. P. Cotter and S. J. Jacobs. OEMsr-202; Service Project No. NO-291; OSRD No. 5618. Carnegie Institute of Technology. January 22, 1946.

M7 The application of flash photography to the study of explosion phenomena. Elizabeth M. Boggs, R. J. Brumbaugh and G. H. Messerly. OEMsr-202; Service Project Nos. OD-02 and NO-291; OSRD No. 5616. Carnegie Institute of Technology. January 28, 1946.

402 **Shaped Charge Studies**

M1 Shaped charges. (Interim Report Nos. SC-1 to SC-24 [covering period from] August 15, 1943 to August 15, 1945.) Compiled by: George B. Kistiakowsky and Howard J. Fisher. Service Project No. AN-1.

M2 Development of the antisubmarine shaped-charge scatter bomb. (Final report.) (n.a.) OEMsr-764; Service Project No. AN-1; OSRD No. 5760. E. I. duPont de Nemours and Company, Inc. October 1, 1945.

M3 Shaped-charge torpedo warheads. J. K. Detrick. OEMsr-764; Service Project No. AN-1; OSRD No. 5752. E. I. duPont de Nemours and Company, Inc. October 9, 1945.

M4 Antisubmarine shaped-charge follow-through bomb. G. C. Jacquot. OEMsr-764; Service Project No. AN-1; OSRD No. 5753. E. I. duPont de Nemours and Company, Inc. October 22, 1945.

M5 Momentum and kinetic energy of the shaped-charge jet. M. A. Paul and J. F. Lemons. OEMsr-202; Service Project No. AN-1; OSRD No. 5570. Carnegie Institute of Technology. October 23, 1945.

M6 Underwater penetration by small-scale shaped charges. E. P. Meibohm and M. A. Paul. OEMsr-202; Service Project No. AN-1; OSRD No. 5569. Carnegie Institute of Technology. October 24, 1945.

M7 Development of a shaped-charge follow-through weapon. (Final report.) Morris Muskat. OEMsr-959; Service Project No. AN-1; OSRD No. 6227. Gulf Research and Development Company. November 20, 1945.

M8 Shaped-charge bombs. J. F. Lemons, E. J. Huber and M. A. Paul. OEMsr-202; Service Project No. AN-1; OSRD No. 5600. Carnegie Institute of Technology. December 20, 1945.

M9 Point-initiating fuzes for shaped-charge weapons. J. F. Lemons and M. A. Paul. OEMsr-202; Service Project No. AN-1; OSRD No. 5601. Carnegie Institute of Technology. January 3, 1946.

M10 Studies of a sharpened charge assisted shaped armor-piercing bomb. L. Paul Saxer. OEMsr-202; Service Project No. AN-1; OSRD No. 5605. Carnegie Institute of Technology. January 18, 1946.

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- M11** Shaped detonation waves. S. J. Jacobs and Robert J. Grabenstetter. OEMsr-202; Service Project No. AN-1; OSRD No. 5603. Carnegie Institute of Technology. January 28, 1946.
- 403 Initial Shock Wave Studies**
- M1** The effect of charge wrapping on the optical records of detonating explosives. (Progress Report to April 15, 1943.) G. H. Messerly. OEMsr-202; Service Project No. OD-04; OSRD No. 1413. Carnegie Institute of Technology. May 14, 1943.
- M2** Optical studies of strong shock waves. Elizabeth M. Boggs and M. D. Hurwitz. OEMsr-202; Service Project Nos. OD-04 and NO-291; OSRD No. 5613. Carnegie Institute of Technology. January 15, 1946.
- 404 Penetration Studies**
- M1** Penetration of steel targets by linear charges. (Progress Report to April 1, 1943.) M. A. Paul. OEMsr-202; Service Project No. AN-1; OSRD No. 1383. Carnegie Institute of Technology. May 4, 1943.
- M2** Target penetration by the jet from a rotating cone charge. M. A. Paul. OEMsr-202; Service Project No. AN-1; OSRD No. 1680. Carnegie Institute of Technology. August 5, 1943.
- M3** Target penetration by the jet from a rotating cone charge. M. A. Paul. OEMsr-202; Service Project No. AN-1; OSRD No. 3874. Carnegie Institute of Technology. July 10, 1944.
- M4** Fundamental study of panel penetration. R. W. Drake. OEMsr-202; Service Project Nos. OD-152, NO-110 and NO-167; OSRD No. 5623. Carnegie Institute of Technology. November 9, 1945.
- 405 Fragmentation Studies**
- M1** Controlled fragmentation and shaped charges. (Interim Report Nos. CF-1 to CF-12 [covering period from] August 15, 1942 to August 15, 1943.) Compiled by: George B. Kistiakowsky. Service Project Nos. AN-1, NO-110 and NO-133.
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- M6** Fragment velocity and panel penetration. A comparison of haleite and ednatol with service filling. Part V, [The] M-49A2 60-mm mortar shell. Part VI, [The] M-54 37-mm projectile. R. W. Drake. OEMsr-202; Service Project Nos. OD-152 and NO-110; OSRD No. 3079. Carnegie Institute of Technology. January 3, 1944.
- M7** Fragment velocity and fragmentation of 3"/50 Mark 29, Model 3, armor-piercing shell, loaded with Composition A-3 and Explosive D. R. W. Drake. OEMsr-202; Service Project Nos. NO-110, NO-167 and OD-152; OSRD No. 5213. Carnegie Institute of Technology. June 15, 1945.
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- M11** Three-station fragment retardation apparatus at Bruceton. R. W. Drake. OEMsr-202; Service Project Nos. NO-110, NO-167 and OD-152; OSRD No. 5619. Carnegie Institute of Technology. December 3, 1945.
- M12** Panel fragmentation trials of various 81-mm mortar shells. R. W. Drake. OEMsr-202; Service Project No. OD-152; OSRD No. 5620. Carnegie Institute of Technology. December 3, 1945.
- M13** Dependence of fragment velocity and fragment penetration on charge-weight ratio of shells. R. W. Drake. OEMsr-202; Service Project Nos. NO-110, NO-167 and OD-152; OSRD No. 5621. Carnegie Institute of Technology. December 21, 1945.
- M14** Fragment velocity and panel penetration of several explosives in simulated shells. R. W. Drake. OEMsr-202; Service Project Nos. NO-167 and OD-152; OSRD No. 5622. Carnegie Institute of Technology. January 2, 1946.
- M15** Studies of shell-fragment mass distribution. Part I, Navy 3"/50 antiaircraft projectiles, Mark 27-3 and

Mark 31-1. M. A. Paul and W. K. Hall. OEMsr-202; Service Project Nos. NO-167 and OD-152; OSRD No. 5607. Carnegie Institute of Technology. January 5, 1946.

M16 Controlled fragmentation of thin-cased munitions. Eugene H. Eyster. OEMsr-202; Service Project Nos. NO-110, NO-167 and OD-152; OSRD No. 5630. Carnegie Institute of Technology. January 15, 1946.

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M4 Penetration of steel targets in air by small-scale cavity charges. M. A. Paul. OEMsr-202; Service Project No. AN-1; OSRD No. 1861. Carnegie Institute of Technology. September 29, 1943.

M5 Improvements in the performance of cavity charges. M. A. Paul and J. F. Lemons. OEMsr-202; Service Project No. AN-1; OSRD No. 3443. Carnegie Institute of Technology. April 3, 1944.

M6 Scaling laws for underwater penetration with cavity charges. J. K. Detrick. OEMsr-764; Service Project No. AN-1; OSRD No. 5392. E. I. duPont de Nemours and Company, Inc. August 1, 1945.

M7 Target penetration by rotating cavity charges. M. A. Paul. OEMsr-202; Service Project No. AN-1; OSRD No. 5598. Carnegie Institute of Technology. November 5, 1945.

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M1 Calculation of detonation pressures of several explosives. Stuart R. Brinkley, Jr. and E. Bright Wilson, Jr. NDCrc-168; Service Project Nos. OD-02 and NO-144; OSRD No. 1231. Harvard University. March 1, 1943.

M2 Detonation, fragmentation and air blast. (Interim Report Nos. DFA-1 to DFA-10 and DF-11 to DF-20 [covering period from] August 15, 1943 to August 15, 1945.) Compiled by: George B. Kistiakowsky and Howard J. Fisher. Service Project Nos. OD-02, OD-03 and others.

M3 Closed bomb burning of high explosives and propellants. S. J. Jacobs and W. B. Buck. OEMsr-202; Service Project No. OD-04; OSRD No. 6329. Carnegie Institute of Technology. January 22, 1946.

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M1 The prediction of detonation velocities of solid explosives. (Report No. 6.) George B. Kistiakowsky and E. Bright Wilson, Jr. [NDCrc-168;] Service Project No. OD-02; OSRD No. 69. Harvard University. January 17, 1941.

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M3 The rate of detonation of various explosive compounds. G. H. Messerly. OEMsr-202; Service Project Nos. OD-01 and OD-04; OSRD No. 1219. Carnegie Institute of Technology. February 22, 1943.

M4 Calculation of the detonation velocities of some pure explosives. Stuart R. Brinkley, Jr. and E. Bright Wilson, Jr. NDCrc-168; Service Project Nos. OD-02 and NO-144; OSRD No. 1707. Harvard University. August 12, 1943.

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M6 The detonation velocity of explosive mixtures containing ammonium nitrate. F. J. Martin and G. H. Messerly. OEMsr-202; Service Project No. OD-04; OSRD No. 3411. Carnegie Institute of Technology. March 24, 1944.

M7 The estimation of detonation pressure from the shock-wave velocity in lead. Elizabeth M. Boggs, G. H. Messerly and Elijah Swift, Jr. OEMsr-202; Service Project Nos. NO-291 and OD-04; OSRD No. 5612. Carnegie Institute of Technology. December 14, 1945.

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502 Detonation Waves

- M1** Theory of detonation waves. (Progress Report No. 238, to April 1, 1942.) John von Neumann. OEMsr-218; Service Project No. OD-02; OSRD No. 549. Institute for Advanced Study. May 4, 1942.
- M2** Calculation of the detonation properties of some service explosives. (Progress Report to June 1, 1943.) Stuart R. Brinkley, Jr. and E. Bright Wilson, Jr. NDCrc-168; Service Project Nos. OD-02 and NO-144; OSRD No. 1510. Harvard University. June 14, 1943.
- M3** The theory of explosion initiation. Ransom B. Parlin, George H. Duffy and others. OEMsr-957; Service Project No. OD-02; OSRD No. 2026. Princeton University. November 13, 1943.
- M4** The chemical reaction in a detonation wave. Henry Eyring, Richard E. Powell and others. OEMsr-957; Service Project Nos. NO-224 and OD-02; OSRD No. 3796. Princeton University. June 17, 1944.
- M5** Initiation studies in solid explosives. Elizabeth M. Boggs, G. H. Messerly and H. A. Strecker. OEMsr-202; Service Project Nos. NO-291 and OD-04; OSRD No. 5617. Carnegie Institute of Technology. December 14, 1945.

600 PROPELLANTS

601 Burning, Theory of

- M1** Specific impulse and burning rates of composite propellants 218-B and 218. Charles G. Sage. OEMsr-202; Service Project No. OD-14; OSRD No. 1627. Carnegie Institute of Technology. July 20, 1943.
- M2** Variation of burning properties of composite propellants with temperature. Charles G. Sage. OEMsr-202; Service Project No. OD-14; OSRD No. 1815. Carnegie Institute of Technology. September 18, 1943.
- M3** An apparatus for the arrested burning of gun propellants. J. F. Kincaid and B. P. Dailey. OEMsr-202; Service Project No. OD-05; OSRD No. 1836. Carnegie Institute of Technology. September 22, 1943.
- M4** Inhibition of nitroglycerine diffusion in coatings for restricting burning of rocket propellants. Rufus W. Lumry. OEMsr-202; Service Project No. OD-14; OSRD No. 1995. Carnegie Institute of Technology. November 5, 1943.
- M5** The theory of the burning of double-base rocket powders. Oscar K. Rice. OEMsr-976; Service Project No. OD-14; OSRD No. 5224. University of North Carolina. June 25, 1945.
- M6** The theory of the burning of rocket powders. (Final report.) Oscar K. Rice. OEMsr-976; Service Project No. OD-14; OSRD No. 5574. University of North Carolina. November 1, 1945.

- M7** Heats of combustion, heats of explosion and burning rates of ammonium picrate-potassium nitrate composite propellants. R. W. Broge. OEMsr-202; Service Project No. OD-14; OSRD No. 5585. Carnegie Institute of Technology. November 15, 1945.
- M8** A turbidity method for determining particle size of potassium nitrate. F. A. Long and G. Long. OEMsr-639; Service Project No. OD-198; OSRD No. 5697. Monsanto Chemical Company. November 23, 1945.
- M9** Investigations of the linear burning rates of propellant powders of various compositions. Linus C. Pauling and Stanley C. Burket. OEMsr-881; Service Project Nos. OD-14, OD-158 and NO-27; OSRD No. 5972. California Institute of Technology. December 6, 1945.

602 Analyses

- M1** Measurements of pH on smokeless powders. Linus C. Pauling, John W. Otvos and David P. Shoemaker. OEMsr-881; Service Project Nos. OD-158 and NO-274; OSRD No. 5968. California Institute of Technology. November 28, 1945.
- M2** Development of propellants containing RDX. A. A. Ebert and W. M. Branan. OEMsr-1355; Service Project No. OD-05; OSRD No. 6216. E. I. duPont de Nemours and Company, Inc. December 20, 1945.
- M3** Polarographic investigation of single-base powders. (n.a.) OEMsr-1040; Service Project No. OD-118; OSRD No. 5751. University of Wisconsin. January 15, 1946.

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- M1** Thermochemical examination of a number of commercial and experimental propellants. (Progress Report to May 15, 1943.) J. F. Kincaid and B. P. Dailey. OEMsr-202; Service Project No. OD-05; OSRD No. 1578. Carnegie Institute of Technology. July 8, 1943.
- M2** The estimation of moisture in solventless double-base powders. Richard M. Noyes. OEMsr-881; Service Project Nos. OD-158 and NO-274; OSRD No. 4672. California Institute of Technology. February 8, 1945.
- M3** The separation of nitroglycerin from double-base powders. F. H. Westheimer. OEMsr-202; Service Project No. OD-01; OSRD No. 5591. Carnegie Institute of Technology. November 1, 1945.
- M4** New and improved syntheses of miscellaneous organic compounds. Philip E. Wilcox. OEMsr-881; Service Project Nos. NO-274 and OD-158; OSRD No. 5974. California Institute of Technology. November 27, 1945.
- M5** Thermochemical studies of special propellants. (n.a.) OEMsr-1355; Service Project Nos. OD-05 and NO-135; OSRD No. 6217. E. I. duPont de Nemours and Company, Inc. January 16, 1946.

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- M1** Some experiments dealing with the effect of carbon

- black and nigrosine on the stability of ballistite. Earl O. Wilson. OEMsr-881; Service Project Nos. OD-14 and OD-158; OSRD No. 3783. California Institute of Technology. May 15, 1944.
- M2** Surveillance testing of propellant explosives. Hyman Henkin. OEMsr-202; Service Project Nos. DO-01, OD-05 and others; OSRD No. 4103. Carnegie Institute of Technology. September 5, 1944.
- M3** Adiabatic ignition. F. H. Westheimer. OEMsr-202; Service Project Nos. OD-01 and OD-04; OSRD No. 4758. Carnegie Institute of Technology. February 28, 1945.
- M4** The effect of changes in composition of the stability of trench mortar increments. Kenneth N. Trueblood. OEMsr-881; Service Project No. OD-158; OSRD No. 4821. California Institute of Technology. March 17, 1945.
- M5** Development of a vacuum stability test for double-base powders. William N. Lipscomb, Jr. OEMsr-881; Service Project Nos. OD-158 and NO-274; OSRD No. 5149. California Institute of Technology. May 30, 1945.
- M6** The effect of variations in composition on the stability of ballistite. Kenneth N. Trueblood. OEMsr-881; Service Project Nos. OD-158 and NO-274; OSRD No. 5418. California Institute of Technology. August 7, 1945.
- M7** Studies on the condition and stability of 7/8-inch stick powder containing 100-percent rework. Jerry Donohue. OEMsr-881; Service Project No. OD-158; OSRD No. 5969. California Institute of Technology. September 21, 1945.
- M8** An investigation of the possible correlation of changes in color with the condition and stability of certain production lots of stick powder. Jerry Donohue. OEMsr-881; Service Project No. OD-158; OSRD No. 5533. California Institute of Technology. September 28, 1945.
- M9** Development of a vacuum stability test for double-base powder. William N. Lipscomb, Jr. OEMsr-881; Service Project Nos. OD-158 and NO-274; OSRD No. 5954. California Institute of Technology. October 18, 1945.
- M10** A nomogram for calculation of results of vacuum stability tests. Jerry Donohue and Fred D. Ordway. OEMsr-881; Service Project Nos. OD-158 and NO-274; OSRD No. 5964. California Institute of Technology. October 19, 1945.
- M11** Stabilization of smokeless powder by ethyl centralite. [Part] I, Transformation products of ethyl centralite in double-base powder. Kenneth N. Trueblood. OEMsr-881; Service Project Nos. NO-274 and OD-158; OSRD No. 5967. California Institute of Technology. October 30, 1945.
- M12** Studies of the effect of various salts on the vacuum stability behaviour of solventless double-base powders. Philip Hayward. OEMsr-881; Service Project Nos. NO-274 and OD-158; OSRD No. 5960. California Institute of Technology. November 13, 1945.
- M13** Stabilization of smokeless powder by diphenylamine. [Part] II, Transformation products of diphenylamine in FNH and pyro powder. Laura L. Fong. OEMsr-881; Service Project Nos. NO-274 and OD-158; OSRD No. 5966. California Institute of Technology. November 13, 1945.
- M14** A new apparatus for studying the stability of smokeless powders. A highly modified form of the Taliani test. Victor Schocken. OEMsr-881; Service Project Nos. NO-274 and OD-158; OSRD No. 5961. California Institute of Technology. November 16, 1945.
- M15** Vacuum stability tests on solventless double-base powders containing various stabilizers. Philip Hayward. OEMsr-881; Service Project Nos. NO-274 and OD-158; OSRD No. 5959. California Institute of Technology. November 20, 1945.
- M16** Changes in the percentages of diphenylamine in single and double-base powders which had been subjected to vacuum stability tests at 110°, 100°, 90° and 80° C. Jerry Donohue. OEMsr-881; Service Project Nos. OD-158 and NO-274; OSRD No. 5957. California Institute of Technology. November 28, 1945.
- M17** Studies relating to the stability of pilot lots of rocket propellant powders. Josephine Bonner and John W. Otvos. OEMsr-881; Service Project No. OD-158; OSRD No. 5955. California Institute of Technology. November 28, 1945.
- M18** Stabilization of smokeless powder by diphenylamine. [Part] I, Transformation products of diphenylamine in double-base powder. Walter A. Schroeder. OEMsr-881; Service Project Nos. OD-158 and NO-274; OSRD No. 5965. California Institute of Technology. November 29, 1945.
- M19** Critical evaluation of results of the application of the vacuum stability test to smokeless powder. Jerry Donohue and William N. Lipscomb, Jr. OEMsr-881; Service Project Nos. OD-158 and NO-274; OSRD No. 5963. California Institute of Technology. December 6, 1945.
- 602.3 Physical Properties**
- M1** Preparation and properties of rolled-sheet powders containing DINA and other explosive plasticizers. Stanley C. Burket and Albert O. Dekker. OEMsr-881; Service Project Nos. OD-158 and NO-274; OSRD No. 5466. California Institute of Technology. August 1, 1945.
- 602.4 Chromatographic Studies**
- M1** Chromatographic studies of smokeless powders and related substances. [Part I.] Robert B. Corey, Albert O. Dekker and others. OEMsr-881; Service Project No. OD-05; OSRD No. 1837. California Institute of Technology. September 25, 1943.
- M2** Chromatographic studies of smokeless powder and related substances. (Part II.) Robert B. Corey and Walter A. Schroeder. OEMsr-881; Service Project Nos. OD-158 and NO-274; OSRD No. 4431. California Institute of Technology. December 6, 1944.
- M3** A chromatographic study of RDX and related sub-

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- M4** Chromatographic studies of smokeless powder and related substances. (Part III.) Kenneth N. Trueblood. OEMsr-881; Service Project Nos. OD-158 and NO-274; OSRD No. 5952. California Institute of Technology. November 14, 1945.

603 Composite Propellants

- M1** The present status of composite propellant 218. (Progress Report to December 30, 1942.) Louis P. Hammett. OEMsr-194, OEMsr-639 and OEMsr-202; Service Project No. OD-14; OSRD No. 1177. Monsanto Chemical Company and Carnegie Institute of Technology. February 3, 1943.
- M2** Tests of methods of mounting grains of composite propellant 218-B in a rocket motor. Henry Posner, Jr. OEMsr-202; Service Project No. OD-14; OSRD No. 1708. Carnegie Institute of Technology. August 12, 1943.
- M3** Rifle bullet tests on composite propellant 218-B and on ballistite. Henry Posner, Jr. OEMsr-202; Service Project No. OD-14; OSRD No. 1706. Carnegie Institute of Technology. August 12, 1943.
- M4** The compression strength of composite propellants. F. A. Long. OEMsr-202; Service Project No. OD-14; OSRD No. 1758. Carnegie Institute of Technology. August 31, 1943.
- M5** Preliminary engineering report on the manufacture of composite propellant 218-B. E. H. Buford, Ira Phelps and A. E. Marshall. OEMsr-639; Service Project No. OD-14; OSRD No. 1822. Monsanto Chemical Company. September 20, 1943.
- M6** Compression strength of grains of composite propellant 218-B prepared at the Monsanto Pilot Plant. F. A. Long. OEMsr-202; Service Project No. OD-14; OSRD No. 3076. Carnegie Institute of Technology. January 1, 1944.
- M7** Purge pellet work at the Explosives Laboratory. (Progress Report to November 20, 1943.) F. A. Long. OEMsr-202; Service Project No. OD-14; OSRD No. 3184. Carnegie Institute of Technology. January 27, 1944.
- M8** The development and properties of large, long-burning grains of composite propellants. (Progress Report to February 10, 1944.) F. A. Long. OEMsr-202; Service Project Nos. OD-14 and AC-75; OSRD No. 3325. Carnegie Institute of Technology. March 7, 1944.
- M9** Ballistic properties of composite propellants 404 and 492. R. W. Broge. OEMsr-202; Service Project Nos. AC-75 and OD-14; OSRD No. 5043. Carnegie Institute of Technology. May 9, 1945.
- M10** Survey of investigations on new propellants for rockets and other jet-propulsion devices. Louis P. Hammett. OEMsr-202; Service Project Nos. AC-75, NA-197 and others; OSRD No. 5463. Carnegie Institute of Technology. August 18, 1945.

603.1 Molded

- M1** The flow and friction properties of composite propellant 218 and similar compositions. Walter Kauzmann. OEMsr-202; Service Project No. OD-14; OSRD No. 3281. Carnegie Institute of Technology. February 14, 1944.
- M2** Pilot plant pressing of molded composite propellant. S. A. Francis. OEMsr-639; Service Project Nos. AC-75 and OD-198; OSRD No. 5702. Monsanto Chemical Company. November 5, 1945.
- M3** Investigation of a drum dryer method of producing composite propellant molding powder. W. B. Dunlap. OEMsr-639; Service Project Nos. AC-75 and OD-198; OSRD No. 5696. Monsanto Chemical Company. November 5, 1945.
- M4** Development of twelve-inch diameter grains of molded composite propellants. F. A. Long. OEMsr-639; Service Project Nos. AC-75 and OD-198; OSRD No. 5698. Monsanto Chemical Company. November 8, 1945.
- M5** General properties of molded composite propellants. F. A. Long. OEMsr-639; Service Project Nos. AC-75, OD-14 and OD-198; OSRD No. 5700. Monsanto Chemical Company. November 8, 1945.
- M6** Construction at the Monsanto pilot plant for molded composite propellants. R. E. Lenz and W. R. Schwandt. OEMsr-639; Service Project Nos. AC-75, OD-14 and OD-198; OSRD No. 5707. Monsanto Chemical Company. November 15, 1945.
- M7** Ultrasonic inspection of grains of molded composite propellant. J. N. Addams and H. L. Greenwald. OEMsr-639; Service Project No. OD-198; OSRD No. 5699. Monsanto Chemical Company. November 20, 1945.
- M8** Characteristics of low-thrust, long-burning jet-propulsion units utilizing molded composite propellant. R. A. Ruehrwein. OEMsr-639; Service Project No. OD-198; OSRD No. 5705. Monsanto Chemical Company. November 20, 1945.
- M9** Molded composite propellants for artillery rockets. R. A. Ruehrwein and Rodger L. Schaefer. OEMsr-639; Service Project No. OD-14; OSRD No. 5701. Monsanto Chemical Company. November 29, 1945.
- M10** Process report on pilot plant production of molded composite propellant for ACL-1 charges. Walter H. Hammond and Rodger L. Schaefer. OEMsr-639; Service Project Nos. AC-75 and OD-198; OSRD No. 5706. Monsanto Chemical Company. November 29, 1945.
- M11** Milling of composite propellant molding powder. W. M. Hutchinson. OEMsr-639; Service Project No. OD-198; OSRD No. 5709. Monsanto Chemical Company. November 29, 1945.
- M12** High-pressure clamping for assembly of solid charges of molded composite propellant. F. A. Long and C. E. Norton. OEMsr-639; Service Project No. OD-198; OSRD No. 5708. Monsanto Chemical Company. November 30, 1945.
- M13** Design of motors for large-diameter charges of molded composite propellant. J. F. Dewald and

C. E. Norton. OEMsr-639; Service Project Nos. AC-75 and OD-198; OSRD No. 5722. Monsanto Chemical Company. November 30, 1945.

M14 Recommendations for future developmental work on molded composite propellants. F. A. Long. OEMsr-639; Service Project No. OD-198; OSRD No. 6308. Monsanto Chemical Company. November 30, 1945.

M15 Cementing technique for fabricating charges of molded composite propellant. W. K. McEwen. OEMsr-202 and OEMsr-639; Service Project Nos. AC-75 and OD-198; OSRD No. 5587. Carnegie Institute of Technology and Monsanto Chemical Company. December 4, 1945.

M16 Coats to restrict the burning surface of molded composite propellant charges. W. K. McEwen. OEMsr-202 and OEMsr-639; Service Project Nos. AC-75 and OD-198; OSRD No. 5588. Carnegie Institute of Technology and Monsanto Chemical Company. December 4, 1945.

M17 Non-setting binders for molded composite propellants. W. M. Hutchinson. OEMsr-202 and OEMsr-639; OSRD No. 5586. Carnegie Institute of Technology and Monsanto Chemical Company. December 26, 1945.

603.2 Solvent, Extruded

M1 Extrusion of cordite at Explosives Research Laboratory. (Progress Report to March 1, 1943.) J. E. Ablard. OEMsr-202; Service Project No. NO-99; OSRD No. 1336. Carnegie Institute of Technology. April 10, 1943.

M2 The screw extrusion of composite propellants. Walter Kauzmann. OEMsr-202; Service Project No. OD-14; OSRD No. 3282. Carnegie Institute of Technology. February 14, 1944.

M3 The properties and applications of EJ powders. R. A. Ruehrwein, Rufus W. Lumry and J. F. Kincaid. OEMsr-202; Service Project No. OD-14; OSRD No. 4053. Carnegie Institute of Technology. September 5, 1944.

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M5 The grinding, classification and particle size control of crystalline ingredients for solvent-extruded composite propellants. R. C. C. St. George, Jr. OEMsr-202; Service Project Nos. OD-14 and OD-200; OSRD No. 5578. Carnegie Institute of Technology. October 24, 1945.

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- M3** Vacuum stability tests on experimental powders containing phthalide. David P. Shoemaker. OEMsr-881; Service Project No. NO-274; OSRD No. 4971. California Institute of Technology. April 23, 1945.
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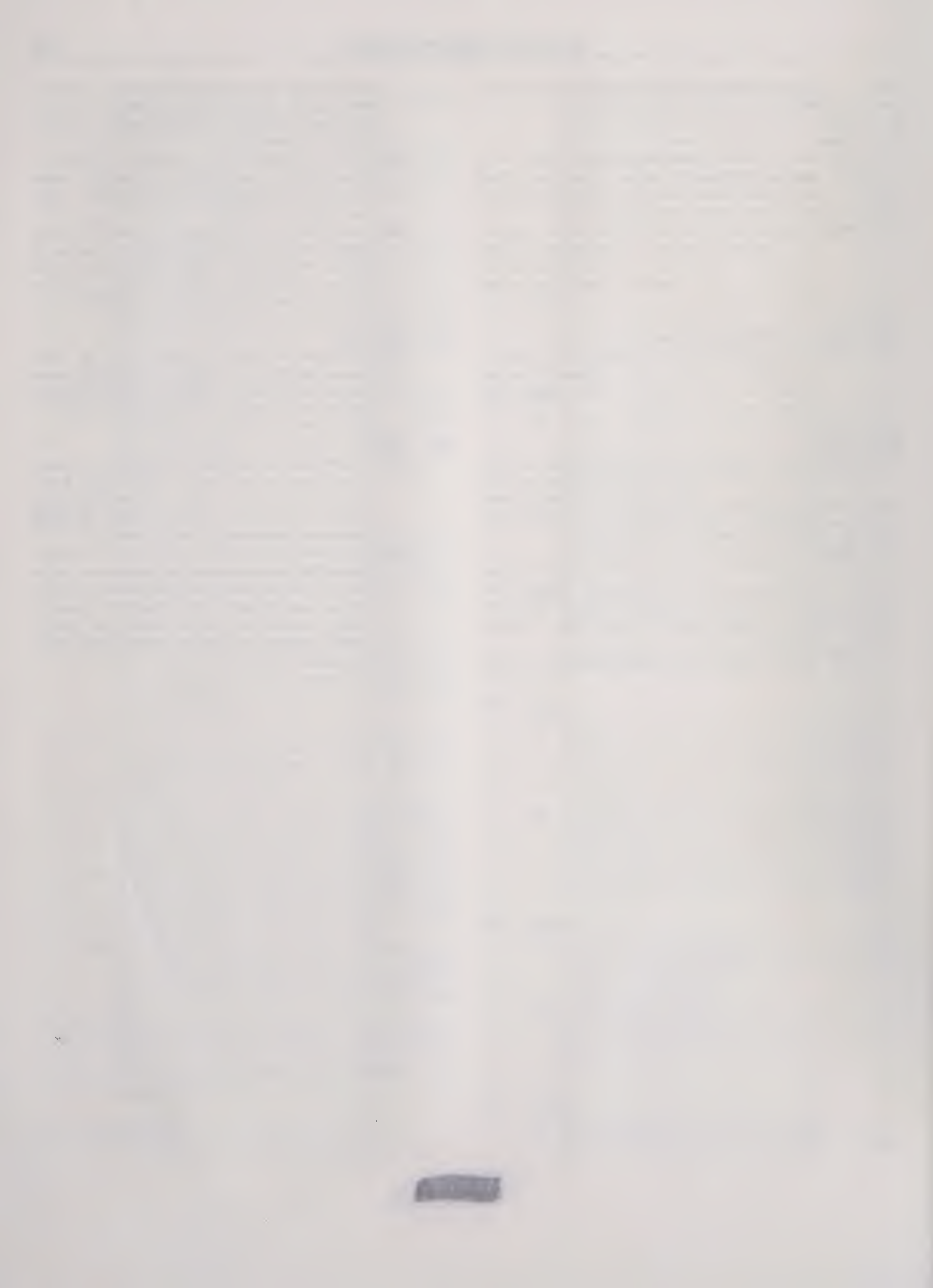
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List of Microfilmed Reports

10 SUMMARY REPORTS FOR DIVISION 9

- M1** Reports by section chairman. Meeting of March 5, 1942, Washington, D. C. (Report No. 202.) (n.a.) OSRD No. 443. March 10, 1942.
- M2** Collection of papers on chemical warfare. Edited by: Joseph Dec and W. Conway Pierce. August 1, 1944.
- M3** Monthly progress reports from the NDRC Munitions Development Laboratory. (Reports for August, 1944 and August, 1945.) Edited by: H. F. Johnstone. OEMsr-102; Service Project Nos. CWS-27, AC-108 and others. University of Illinois. September 25, 1944 and September 25, 1945.

100 CHEMICAL WARFARE SUMMARY REPORTS

110 Fasciculus on Chemical Warfare Medicine

- M1** Fasciculus on chemical warfare medicine. Volume I, Eye. (n.a.) OEMcmr-24, OEMcmr-9 and OEMcmr-141. Wilmer Institute; University of Pennsylvania, Medical School and Harvard University, Medical School. 1945.
- M2** Fasciculus on chemical warfare medicine. Volume II, Respiratory tract. (n.a.) OEMcmr-39, OEMcmr-44 and others. Yale University, Medical School; University of Chicago, Medical School and others. 1945.
- M3** Fasciculus on chemical warfare medicine. Volume III, Skin and systemic poisons. (n.a.) OEMcmr-141, OEMcmr-103 and others. Harvard University, Medical School; Cornell University, Medical School and others. 1945.

120 Informal Monthly Progress Reports

121 California Institute of Technology

- M1** The analysis of chemical warfare agents. (Informal Monthly Progress Reports [covering the periods, from March 10 to April 10, 1944 and from July 10 to September 10, 1945.] E. H. Swift, Carl Niemann and others. OEMsr-325. [California Institute of Technology.] April 10, 1944, August 10, 1945 and September 10, 1945.

122 Iowa State College

- M1** [Variously nitrated organic compounds containing metals.] (Monthly informal reports.) Henry Gilman. OEMsr-97. Iowa State College. December 6, 1941 to January 14, 1942; March 15, 1942 to January, 1943.
- M2** [Derivatives, irritants and organic compounds of phosphorus, arsenic and some metals.] (Informal monthly progress reports.) Henry Gilman, R. W. Leeper and others. OEMsr-97. [Iowa State College.] February 10, 1943 to March 10, 1944.

- M3** [Carbamates, antimalarial intermediates and derivatives.] (Informal monthly progress reports.) Henry Gilman, S. Avakian and others. OEMsr-97. [Iowa State College.] September 10, 1944 to August 10, 1945.

123 Northwestern University

- M1** [Toxicity data.] (Informal Monthly Progress Reports [covering the] period April 12, 1944 to August 10, 1945.) Charles D. Hurd, M. Q. Webb and others. OEMsr-135. [Northwestern University.]

124 Rockefeller Institute for Medical Research

- M1** [Identification and characteristics of various substances.] (Report No. 18-N-23.) John H. Northrop. [Rockefeller Institute for Medical Research.] April 14, 1942.
- M2** [Reactions and toxicity of RH.] (Progress Report No. 5.) Max Bergmann, Joseph S. Fruton and others. OEMsr-313. [Rockefeller Institute for Medical Research.] [May 23, 1942.]
- M3** [Toxicity of DH and therapeutic treatment.] (Informal monthly progress report.) Philip D. McMaster and George H. Hogeboom. OEMsr-434. [Rockefeller Institute for Medical Research.] August 28, 1942.
- M4** Informal Monthly Progress Report Nos. 18-N-34 and -39. John H. Northrop, Moses Kunitz and others. OEMsr-129. [Rockefeller Institute for Medical Research.] September 19, 1942 and February 10, 1943.
- M5** Informal Monthly Progress Reports [for] March 10, April 10, May 10, June 10, July 10, September 10, October 10 and December 10, 1943; January 10, February 10, March 10, May 10, June 10 and August 10, 1944. Max Bergmann, Joseph S. Fruton and others. OEMsr-313. Rockefeller Institute for Medical Research.

125 University of Chicago

- M1** Progress reports [of the] Toxicity Laboratory, University of Chicago. (n.a.) [NDCrc-132.] University of Chicago. October 16, 1941 to December 31, 1942.
- M2** Toxicity of chemical warfare agents. (Informal Monthly Progress Report Nos. 9-4-1-1 to -25.) (n.a.) NDCrc-132; Service Project No. CWS-2. University of Chicago. February 10, 1943 to February 28, 1945.

126 University of Illinois

- M1** A study of chemical warfare agents and the synthesis of therapeutic intermediates. (Informal Monthly Progress Reports covering the period

from October 10, 1944 to May 9, 1945.) R. C. Fuson, Charles C. Price and others. OEMsr-300. [University of Illinois.]

127 **University of Missouri**

M1 Smoke detection. (Informal Monthly Progress Reports [covering period from] January 11 to February 28, 1945.) Henry E. Bent. Lloyd B. Thomas and Elijah Swift, Jr. OEMsr-312. University of Missouri. February 10 and 28, 1945.

128 **University of Nebraska**

M1 [Preparation of arsenicals, derivatives, antimalarials and other substances.] (Informal Monthly Progress Reports covering the period from June 8, 1944 to August 6, 1945.) Cliff S. Hamilton, E. J. Cragoe and others. OEMsr-85. [University of Nebraska.]

200 **PREPARATION AND ANALYSIS OF CHEMICAL WARFARE AGENTS**

M1 Compounds prepared for Chemical Warfare Service by NDRC. (Progress Report No. 51, as of June 1, 1941.) (n.a.) NDCrc-48, NDCrc-6 and others; Service Project Nos. CWS-3 CWS-4 and CWS-9; OSRD No. 113. University of Illinois, University of Wisconsin and others. June 27, 1941.

M2 Summary report on work done on chemical warfare problems at the University of Illinois. (Final Report No. 360 [for the period] from September 15, 1941 to August 15, 1942.) C. S. Marvel and R. C. Fuson. OEMsr-48; Project Nos. CWS-4 and NL-B31; OSRD No. 878. University of Illinois. September 11, 1942.

M3 Rapid methods for synthesizing certain war gases. The chemistry of the sulfur fluorides. (Final Report No. 399.) J. H. Simons. NDCrc-167; Service Project No. CWS-7; OSRD No. 1036. Pennsylvania State College. October 21, 1942.

M4 Volatility of certain arsenic and nitrogen compounds. (Progress Report No. 427, to August 1, 1942.) Henry E. Bent. OEMsr-312; Service Project No. CWS-6; OSRD No. 1045. University of Missouri. November 10, 1942.

M5 Possible toxic agents and intermediates. (Progress Report to December 14, 1942.) Morris S. Kharasch. OEMsr-394; Service Project Nos. CWS-3 and CWS-4; OSRD No. 1284. University of Chicago. March 22, 1943.

M6 Preparation of compounds other than nitrogen mustards. Derivatives of chemical warfare agents. (Progress Report to January 10, 1944.) George H. Coleman, Joseph E. Callen and others. OEMsr-223; Service Project No. CWS-4; OSRD No. 3354. State University of Iowa. March 14, 1944.

M7 Tables of the physical constants of chemical warfare agents. (Informal Report No. 97.) E. H. Swift and Carl Niemann. OEMsr-325; Service Project No. CWS-6. California Institute of Technology. June 5, 1944.

M8 A summary of the vapor pressures and volatilities of compounds studied at the University of Chicago Toxicity Laboratory. (Progress Report to August 1, 1944.) C. Ernst Redemann, Saul W. Chaikin and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 4273. University of Chicago. November 4, 1944.

M9 Electron diffraction studies on the molecular structure of chemical warfare agents. (Final Report to June 30, 1944.) Linus C. Pauling. OEMsr-753; Service Project No. CWS-6; OSRD No. 4385. California Institute of Technology. November 25, 1944.

M10 [Physico-chemical properties bearing on the toxic action of chemical warfare agents.] Final report under Contract OEMsr-532. Barnett Cohen, Joseph Harris and others. OEMsr-532; Service Project No. CWS-2; OSRD No. 5146. Johns Hopkins University. May 29, 1945.

M11 The preparation of miscellaneous chemical warfare agents. (Progress Report to June, 1945.) Homer Adkins, John E. Castle and others. OEMsr-304; Service Project No. CWS-4; OSRD No. 6086. University of Wisconsin. December 1, 1945.

210

Metalloid and Metal-Containing Compounds

M1 Preparation of organometallic compounds as sources of toxic oxide smokes and flame thrower fuels. (Final Report No. 156, to September 1, 1941.) Henry Gilman. NDCrc-61; Service Project Nos. CWS-1 and CWS-10; OSRD No. 314. Iowa State College. January 9, 1942.

211

Phosphorous

(See also: 311)

211.1

Fluorophosphates

M1 Fluorophosphates and related compounds. ([Monthly] informal reports.) John C. Bailar, Jr., Mark M. Woyski and others. OEMsr-299. University of Illinois. July 15, October 15, November 15, December 15, 1942; February 15, April 15, October and November, 1943.

211.11

Diisopropyl Fluorophosphates (PF-3)

M1 Description of process, preliminary. [Manufacture of] diisopropyl fluorophosphate [by] batch method. (Progress Report to January 1, 1944.) Russell L. Jenkins, W. M. Cooper and others. OEMsr-845; Service Project No. CWS-4; OSRD No. 3113. Monsanto Chemical Company. January 11, 1944.

M2 Description of process, preliminary. [Manufacture of] diisopropyl fluorophosphate [by] continuous method. (Progress Report to January 31, 1944.) Russell L. Jenkins, W. M. Cooper and others. OEMsr-845; Service Project No. CWS-4; OSRD No. 3228. Monsanto Chemical Company. February 1, 1944.

M3 The chemistry of PF-3 as a water contaminant. (Progress Report to February 28, 1945.) Charles

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C. Price and Bernard H. Velzen. OEMsr-593; Service Project No. CWS-6; OSRD No. 5345. University of Illinois. August 10, 1945.

211.12 Alkyl Fluorophosphates

- M1** The dialkyl monofluorophosphates. (Informal Report No. CXLI.) L. F. Audrieth and John C. Bailar, Jr. [OEMsr-299.] University of Illinois. June 16, 1942.
- M2** The alkyl difluorophosphates and the mono- and difluorothiophosphates. (Informal Report No. CL-XXXVIII, for the period August 15 to September 15, 1942.) L. F. Audrieth, John C. Bailar, Jr. and Mark M. Woyski. OEMsr-299; Service Project No. CWS-7. University of Illinois. September 15, 1942.
- M3** Preparation of alkyl fluorophosphates. (Progress Report to December 10, 1943.) Russell L. Jenkins and Edgar E. Hardy. OEMsr-845; Service Project No. CWS-4; OSRD No. 3078. Monsanto Chemical Company. January 5, 1944.

211.2 Phosphoryl

- M1** A new method for the synthesis of phosphoryl chlorofluoride, POCl_2F . John C. Bailar, Jr. and Mark M. Woyski. OEMsr-299. University of Illinois. August 15, 1943.

211.3 Phosphine

- M1** Letter to Dr. Crawford D. Failey. Subject: [The evaluation of KB-220.] Morris S. Kharasch. [University of Chicago.] October 21, 1943.

211.4 Esters

- M1** Letter to Dr. William L. Doyle. Subject: [Compounds submitted to the Toxicity Laboratory for evaluation.] Morris S. Kharasch. [University of Chicago.] June 21, 1945.
- M2** The preparation of ethane-fluorophosphonic acid, isopropyl ester (KB-286), the ethyl analogue of T-144. (Final Report to August 9, 1945.) Morris S. Kharasch, Elwood V. Jensen and Robert L. Adelman. OEMsr-394; Service Project No. CWS-4; OSRD No. 5483. University of Chicago. August 20, 1945.

211.5 German Compounds

- M1** An investigation of a new group of German war gases. (Final Report to August 31, 1945.) R. C. Fuson, Lester J. Reed and others. OEMsr-300; Service Project No. CWS-4; OSRD No. 6400. University of Illinois. December 1, 1945.
- M2** The preparation of MCE and MFI. (Final Report to September 30, 1945.) Russell L. Jenkins and Edgar E. Hardy. OEMsr-845; Service Project No. CWS-4; OSRD No. 6391. Monsanto Chemical Company. December 31, 1945.

212 Sulfur

(See also: 312)

212.1 Sulfides

212.11 Mustard Gas (H)

- M1** [Chemical reaction data on chloroethyl sulfides.] (Informal Report [for the period] December 1, 1941 to June 1, 1942.) W. Mansfield Clark, Barnett Cohen and Joseph Harris. [OEMsr-214.] [Johns Hopkins University.] [June, 1942.]
- M2** The preparation of mustard gas and certain of its derivatives and analogs. (Progress Report No. 345, to August 15, 1942.) C. S. Marvel and R. C. Fuson. OEMsr-48 and OEMsr-300; Service Project No. CWS-4; OSRD No. 840. University of Illinois. August 31, 1942.
- M3** The by-products of commercial mustard gas made from ethylene and the sulfur chlorides. (Report No. 386, to September 15, 1942.) Marvin Carmack and Richard Handrick. Service Project No. CWS-4; OSRD No. 933. University of Pennsylvania. October 8, 1942.
- M4** Reactions of the chlorine atoms of mustard gas in aqueous media. (Progress Report No. 452.) W. E. Doering, R. P. Linstead and Eric G. Ball. OEMsr-86; Service Project No. CWS-2; OSRD No. 1094. Harvard University. December 9, 1942.
- M5** The chemistry of mustard gas as a water contaminant. (Informal Report No. 65.) Charles C. Price and Orville H. Bullitt, Jr. August 21, 1943.
- M6** The reactivity of the chlorine in β , β' -dichlorodiethyl ether, 3,4-dichlorotetrahydrothiophene and bis-1,3-dichloro-2-propyl sulfide. (Progress Report to August 27, 1943.) Paul D. Bartlett and Edward S. Lewis. NDCrc-136; Service Project No. CWS-4; OSRD No. 3605. Harvard University. April 6, 1944.
- M7** An investigation of heated mustard gas. (Progress Report to July, 1944.) R. C. Fuson. OEMsr-300; Service Project No. CWS-4; OSRD No. 3959. University of Illinois. July 28, 1944.
- M8** The synthesis of certain mustard analogs. (Progress Report to August 1, 1944.) Carl R. Noller and L. Kaplan. OEMsr-136; Service Project No. CWS-4; OSRD No. 4195. Stanford University. September 27, 1944.
- M9** Addition of surface-active agents to mustard. (Progress Report to July 31, 1944.) Paul L. Salzberg, W. A. Lazier and J. H. Werntz. OEMsr-549; Service Project No. CWS-4; OSRD No. 4211. E. I. duPont de Nemours and Company, Inc. October 3, 1944.
- M10** A continuous process for the preparation of mustard and sesquimustard. (Progress Report to October, 1944.) R. C. Fuson, Charles C. Price and others. OEMsr-300; Service Project No. CWS-4; OSRD No. 4304. University of Illinois. October 31, 1944.
- M11** [Kinetics of benzyl-H in dilute aqueous solution.] (Informal Monthly Progress Report No. 23.) Barnett Cohen and Ervin R. Van Artsdalen. OEMsr-

532. [Johns Hopkins University.] December 10, 1944.

M12 The mechanism of hydrolysis and displacement of mustard chlorohydrin and mustard in aqueous solutions. (Progress Report to September 25, 1944.) Paul D. Bartlett and C. Gardner Swain. NDCrc-136; Service Project No. CWS-4; OSRD No. 4683. Harvard University. February 10, 1945.

M13 Synthesis of β -chloroethyl sulfides and related compounds. (Progress Report to February 1, 1944.) Paul L. Salzberg, W. A. Lazier and E. K. Ellingboe. OEMsr-549; Service Project No. CWS-4; OSRD No. 5560. E. I. duPont de Nemours and Company, Inc. September 7, 1945.

212.111 Thiodiglycol (TG)

M1 (T) glycol. (Progress Report No. 15.) Roger Adams and C. S. Marvel. Service Project No. CWS-4; OSRD No. 78. University of Illinois. March 17, 1941.

M2 Mustard gas from thiodiglycol and thionyl chloride. (Final Report to August, 1943.) R. Norris Shreve, David A. Frost and Lewis A. McDonald. OEMsr-835; Service Project No. CWS-4; OSRD No. 3558. Purdue University. May 1, 1944.

212.112 Levinstein Mustard (H)

M1 Hydrolysis of HS. Barnett Cohen and Joseph Harris. [OEMsr-214.] [Johns Hopkins University.] April 25, 1942.

M2 The hydrolysis of beta, beta' dichlorodiethylsulfide in the vapor phase. The quantitative estimation of beta, beta' dichlorodiethylsulfide in solution. (Progress Report No. 263, to May 11, 1942.) Charles C. Price. OEMsr-300; OSRD No. 723. University of Illinois. June 15, 1942.

M3 Effect of detergents and related compounds on the solubility and rate of solution of redistilled Levinstein mustard. (Progress Report No. 275, to June 10, 1942.) John H. Northrop. OEMsr-129; Service Project Nos. CWS-2 and NL-B30; OSRD No. 653. Rockefeller Institute for Medical Research. June 23, 1942.

M4 Freezing points of binary HS mixtures. (Progress Report No. 423, to October 15, 1942.) Paul D. Bartlett. NDCrc-136; Service Project Nos. CWS-3 and CWS-4; OSRD No. 1016. Harvard University. November 9, 1942.

M5 Volatility of Levinstein mustard. (Progress Report No. 439, to September 31, 1942.) Henry E. Bent. OEMsr-312; Service Project No. CWS-6; OSRD No. 1062. University of Missouri. November 10, 1942.

M6 The vapor pressure of HS and diphenyl ether and solutions of these compounds. (Progress Report No. 436, to July 31, 1942.) Henry E. Bent. OEMsr-312; Service Project No. CWS-6; OSRD No. 1059. University of Missouri. November 30, 1942.

M7 Direct determination of the effect of temperature

and chloride ions on the hydrolysis of HS distinguished from β chloro, β' hydroxy diethyl sulfide. (Report No. 7.) W. Morton Grant and V. Everett Kinsey. OEMcmr-141. Harvard University, Medical School. January 14, 1943.

M8 [HS, Levinstein mustard.] (Monthly progress report.) Duncan A. MacInnes and Donald Belcher. OEMsr-130. Rockefeller Institute for Medical Research. November 15, 1943.

M9 Storage characteristics and stabilization of Levinstein H. (Formal Report to January 1, 1944.) John C. Woodhouse, A. S. Weygandt and others. OEMsr-656; Service Project No. CWS-13; OSRD No. 3179. E. I. duPont de Nemours and Company, Inc. January 19, 1944.

M10 The behavior of hexamine in Levinstein mustard. (Progress Report to July, 1944.) R. C. Fuson. OEMsr-300; Service Project No. CWS-4; OSRD No. 3964. University of Illinois. July 28, 1944.

M11 The composition of Levinstein mustard. (Progress Report to August, 1944.) R. C. Fuson, Charles C. Price and others. OEMsr-300; Service Project No. CWS-4; OSRD No. 4177. University of Illinois. September 26, 1944.

M12 The structure of propyl mustard and its analogs. (Progress Report to October, 1944.) R. C. Fuson, Charles C. Price and others. OEMsr-300; Service Project No. CWS-4; OSRD No. 4306. University of Illinois. November 2, 1944.

M13 [Preparation of] 2-chloroethyl 2, 2-dichloroethyl sulfide (2-chloro-H). (Progress Report to December 1, 1944.) R. C. Fuson, Charles C. Price and others. OEMsr-300; Service Project No. CWS-4; OSRD No. 4531. University of Illinois. January 1, 1945.

M14 The concentration of the odorous principle of water-washed Levinstein mustard. The preparation of 2-chloroethyl sulfenyl chloride. (Progress Report to February 28, 1945.) Charles C. Price and Orville H. Bullitt, Jr. OEMsr-593; Service Project No. CWS-6; OSRD No. 4989. University of Illinois. April 26, 1945.

M15 Volatile impurities of Levinstein H. (Progress Report to February 28, 1945.) Roger M. Herriott and John H. Northrop. OEMsr-129; Service Project Nos. CWS-6 and CWS-2; OSRD No. 5147. Rockefeller Institute for Medical Research. May 29, 1945.

212.113 Sesquimustard (Q)

M1 The preparation of ethanedithiol. (Final Report to June 30, 1944.) H. W. Elley, C. E. Sparks and others. OEMsr-1088; Service Project No. CWS-4; OSRD No. 3929. E. I. duPont de Nemours and Company, Inc. August 1, 1944.

M2 The chemistry of Q. (Progress Report to October 25, 1944.) Max Bergmann, Joseph S. Fruton and others. OEMsr-313; Service Project No. CWS-2; OSRD No. 4376. Rockefeller Institute for Medical Research. November 23, 1944.

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- M3** Some aspects of the behavior of Q as a water contaminant. (Progress Report to February 28, 1945.) Charles C. Price and Royston M. Roberts. OEMsr-593; Service Project No. CWS-6; OSRD No. 5202. University of Illinois. June 14, 1945.
- M4** Preparation of ethanedithiol. (Progress Report to June 22, 1944.) Paul L. Salzberg, W. A. Lazier and E. K. Ellingboe. OEMsr-549; Service Project No. CWS-4; OSRD No. 5559. E. I. duPont de Nemours and Company, Inc. September 7, 1945.

212.114 Semi-Mustard (CH)

- M1** Preparation of semi-H. (Report No. 12.) V. Everett Kinsey and W. Morton Grant. OEMcmr-141. Harvard University, Medical School. May 10, 1943.
- M2** Synthesis and characterization of 2-chloroethyl 2-hydroxyethyl sulfide (CH). (Progress Report to December 1, 1944.) R. C. Fuson, Charles C. Price and others. OEMsr-300; Service Project No. CWS-4; OSRD No. 4532. University of Illinois. January 1, 1945.
- M3** Chemical reactions of semi-H and H. (Progress Report to December 15, 1944.) Max Bergmann, Joseph S. Fruton and others. OEMsr-313; Service Project No. CWS-2; OSRD No. 4536. Rockefeller Institute for Medical Research. January 2, 1945.

212.12 Polysulfides

- M1** An investigation of the structure of the lower polysulfides. (Progress Report to February, 1945.) R. C. Fuson, Charles C. Price and others. OEMsr-300; Service Project No. CWS-4; OSRD No. 4835. University of Illinois. March 19, 1945.

212.2 Halides

- M1** Improved methods of preparation and preliminary study of physical and chemical properties of Compound 1120. (Progress Report No. 117.) Anton B. Burg. NDCrc-113; Service Project No. CWS-7; OSRD No. 179. University of Southern California. November 15, 1941.
- M2** The preparation and properties of [Compound] 1120. [Part] II. Progress Report No. 149.) Anton B. Burg, Don L. Armstrong and others. NDCrc-113; OSRD No. 294. University of Southern California. December 30, 1941.
- M3** Heat of formation of S_2F_{10} . (Progress Report No. 306.) Hugh M. Huffman. OEMsr-199; Service Project No. CWS-7; OSRD No. 776. California Institute of Technology. July 29, 1942.
- M4** Calorimetric studies. [Part] II, The entropy and free energy of S_2F_{10} . (Progress Report No. 389.) Hugh M. Huffman. OEMsr-199; Service Project No. CWS-7; OSRD No. 934. California Institute of Technology. October 10, 1942.
- M5** Thermodynamic data on S_2F_{10} . (Progress Report No. 430.) Hugh M. Huffman. OEMsr-199; Service Project No. CWS-7; OSRD No. 1053. Cali-

fornia Institute of Technology. November 21, 1942.

- M6** Production of sulfur monochloride and thionyl chloride without the use of elemental chlorine. (Final Report to December 1, 1942.) John C. Woodhouse, A. S. Weygandt and others. OEMsr-656; Service Project No. CWS-4; OSRD No. 1261. E. I. duPont de Nemours and Company, Inc. March 12, 1943.
- M7** The preparation and properties of 2-chloro-2'-fluorodiethyl sulfide. (Informal Report No. 5.) Morris S. Kharasch and S. Weinhouse. OEMsr-394; Service Project No. CWS-4. University of Chicago. November 24, 1943.
- M8** The preparation of new toxic gases. (Final Report to June 5, 1944.) Anton B. Burg, Don L. Armstrong and others. NDCrc-113; Service Project Nos. CWS-7 and NL-B26; OSRD No. 4012. University of Southern California. August 12, 1944.

212.3 Sulfones

- M1** Chemical reactions of divinyl sulfone, H sulfone and divinyl sulfoxide. (Progress Report to December 1, 1944.) Max Bergmann, Joseph S. Fruton and others. OEMsr-313; Service Project No. CWS-2; OSRD No. 4546. Rockefeller Institute for Medical Research. January 4, 1945.
- M2** The chemistry of sulfonium salts related to H. (Progress Report to December 27, 1944.) Max Bergmann, Joseph S. Fruton and others. OEMsr-313; Service Project Nos. CWS-2 and CWS-4; OSRD No. 4834. Rockefeller Institute for Medical Research. March 19, 1945.
- M3** Some aspects of the chemistry of T as a water contaminant. (Progress Report to February, 1945.) Charles C. Price and Albert Pohland. OEMsr-593; Service Project No. CWS-14; OSRD No. 5030. University of Illinois. May 2, 1945.

212.4 Thiophosgene

- M1** Chlorothiolfomic and chlorodithioformic esters and compounds derived from thiophosgene. Charles D. Hurd. Northwestern University. November 23, 1945.

212.5 Miscellaneous Sulfur Compounds

- M1** A survey of sulfur compounds that have been studied for vesicant activity. R. C. Fuson, C. S. Marvel and others. OEMsr-300; Service Project No. CWS-4; OSRD No. 1377. University of Illinois. April 30, 1943.
- M2** A preliminary evaluation of certain potential water-denial agents. (Informal Report No. 104.) Charles C. Price, Robert E. Foster and Lester J. Reed. [University of Illinois.] [July 18, 1944.]
- M3** [The rate of disappearance of H from human plasma and blood. Preliminary observations on S_2F_{10} .] (Informal Monthly Progress Report No. 25.) Barnett Cohen and Ervin R. Van Artsdalen.

OEMsr-532. [Johns Hopkins University.] February 10, 1945.

- M4** Studies in the synthesis of organic compounds of sulfur, nitrogen and chlorine which possess physiological activity. (Progress Report to May, 1945.) R. C. Fuson, Charles C. Price and H. R. Snyder. OEMsr-300; Service Project No. CWS-4; OSRD No. 5148. University of Illinois. May 29, 1945.

213 Arsenic

(See also: 313)

- M1** Preparation of certain organic arsenicals. (Progress Report No. 46, to June 26, 1941.) Cliff S. Hamilton. NDCrc-16; Service Project No. CWS-3; OSRD No. 108. University of Nebraska. June 27, 1941.
- M2** Problems on arsenicals. (Final Report No. 87, to September 11, 1941.) Cliff S. Hamilton. NDCrc-16; Service Project No. CWS-3; OSRD No. 149. University of Nebraska. October 8, 1941.
- M3** Organic arsenicals. (Annual Report No. 415, to September 15, 1942.) Cliff S. Hamilton. OEMsr-85; Service Project No. CWS-3; OSRD No. 991. University of Nebraska. November 3, 1942.
- M4** Organic arsenicals. (Informal Monthly Progress Report covering period [from] July 10 to August 10, 1943.) Cliff S. Hamilton, E. J. Cragoe and others. OEMsr-85. [University of Nebraska.] August 10, 1943.
- M5** Organic arsenicals. (Progress Report to July 1, 1943.) Cliff S. Hamilton, Jack Morgan and others. OEMsr-85; Service Project No. CWS-3; OSRD No. 1797. University of Nebraska. September 13, 1943.
- M6** The chemistry of certain arsenical chemical warfare agents as water contaminants. (Progress Report to February 25, 1944.) Arthur M. Buswell, Charles C. Price and others. OEMsr-593; Service Project No. CWS-14; OSRD No. 4193. University of Illinois. June 26, 1944.
- M7** Synthesis of organic arsenicals from unsaturated compounds. (Progress Report to March 15, 1943.) W. A. Lazier and S. L. Scott. OEMsr-549; Service Project Nos. CWS-3 and CWS-9; OSRD No. 3428. E. I. duPont de Nemours and Company, Inc. July 13, 1944.
- M8** Microscopical properties of oxidation derivatives of arsenicals. (Progress Report to August 7, 1944.) Clyde W. Mason, George B. DeLaMater and Franklin A. Hamm. OEMsr-842; Service Project No. CWS-6; OSRD No. 3993. Cornell University. August 9, 1944.
- M9** Microscopical properties of derivatives of arsenicals with N-pentamethylenedithiocarbamate. (Progress Report to August 4, 1944.) Clyde W. Mason and George B. DeLaMater. OEMsr-842; Service Project No. CWS-6; OSRD No. 3996. Cornell University. August 9, 1944.

213.1 Arsines

- M1** Vapor pressure of arsine dissolved in thionyl

chloride, *p*-ethylnitrobenzene, 1-nitropropane, triethyl borate and tributyl borate. (Informal Report No. CXL.) L. F. Audrieth and John C. Bailar, Jr. [OEMsr-299.] University of Illinois. June 17, 1942.

213.11 Lewisite (M-1, L)

- M1** Improved methods for the manufacture of lewisite. (Progress Report No. 137, to October 15, 1941.) Paul D. Bartlett. NDCrc-136; Service Project No. CWS-9; OSRD No. 190. Harvard University. December 9, 1941.
- M2** Reaction of M-1, lewisite, with dithiols and other thio agents. (Progress Report No. 184, to February 6, 1942.) Paul D. Bartlett. NDCrc-136; Service Project Nos. NL-B30 and NL-B31; OSRD No. 402. Harvard University. February 20, 1942.
- M3** Improved methods for the manufacture of M-1, lewisite. (Supplementary Progress Report No. 185, to February 12, 1942.) Paul D. Bartlett. NDCrc-136; Service Project No. CWS-9; OSRD No. 407. Harvard University. February 23, 1942.
- M4** The M-1 oxides, beta-chlorovinylarsine oxide. The preparation of slightly impure isomer I oxide and pure isomer II oxide. (Progress Report No. 191, to February 10, 1942.) Paul D. Bartlett. OEMsr-48; Service Project No. CWS-3; OSRD No. 408. Harvard University. February 25, 1942.
- M5** The geometrical isomers of M-1, lewisite. (Progress Report No. 211, to March 3, 1942.) Paul D. Bartlett. NDCrc-136; Service Project No. CWS-3; OSRD No. 470. Harvard University. March 31, 1942.
- M6** Thickening of M-1. (Progress Report No. 269.) Paul D. Bartlett and C. Gardner Swain. OEMsr-135; Service Project No. CWS-12; OSRD No. 655. Harvard University. June 10, 1942.
- M7** The reaction of M-1, lewisite, with amines. The preparation of M-1 diethoxide (diethoxy- β -chlorovinylarsine). (Progress Report No. 333, to June 12, 1942.) Paul D. Bartlett. NDCrc-136; Service Project No. NL-B31; OSRD No. 834. Harvard University. August 26, 1942.
- M8** The reaction of M-1, lewisite, with thiols. The reaction of M-2 with ethanedithiol. (Progress Report No. 335, to June 15, 1942.) Paul D. Bartlett. NDCrc-136; Service Project No. NL-B31; OSRD No. 839. Harvard University. August 26, 1942.
- M9** Preparation of radioactive lewisite. (Progress Report No. 340, to July 15, 1942.) George B. Kistiakowsky. NDCrc-136; Service Project No. CWS-3; OSRD No. 867. Harvard University. August 31, 1942.
- M10** The production of lewisite by the mercuric chloride process. Investigation of the effects of impurities in arsenic trichloride. (Progress Report No. 444, to November 15, 1942.) Paul D. Bartlett. NDCrc-136; Service Project No. CWS-3; OSRD No. 1075. Harvard University. December 7, 1942.
- M11** Production of M-1 by the mercuric chloride

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process. Acceleration of rate of absorption and M-1 production by metallic chloride catalysts. Paul D. Bartlett, Hyp J. Dauben, Jr. and Leonard J. Rosen. NDCrc-136; Service Project No. CWS-9; OSRD No. 1553. Harvard University. July 1, 1943.

M12 The mechanism of the formation of lewisite in the mercuric chloride process. (Progress Report to October 15, 1943.) Paul D. Bartlett, Hyp J. Dauben, Jr. and others. NDCrc-136; Service Project No. CWS-9; OSRD No. 3365. Harvard University. March 16, 1944.

M13 Vapor-phase synthesis of lewisite. (Progress Report to October 2, 1943.) S. L. Scott, W. A. Lazier and Paul L. Salzberg. OEMsr-549; Service Project No. CWS-3; OSRD No. 5561. E. I. duPont de Nemours and Company, Inc. September 7, 1945.

213.12 Furylarsines

M1 Furan arsenicals. (Progress Report No. 316, to June 25, 1942.) Cliff S. Hamilton. OEMsr-85; Service Project No. CWS-3; OSRD No. 796. University of Nebraska. August 12, 1942.

213.13 Cacodyls

M1 The preparation of cacodyl and cacodyl chloride. (Progress Report No. 162, to January 15, 1942.) R. C. Fuson and C. S. Marvel. NDCrc-48 and OEMsr-48; Service Project No. CWS-3; OSRD No. 326. University of Illinois. January 19, 1942.

M2 Catalytic production of homologues of cacodyl and their derivatives. (Progress Report No. 224, to March 27, 1942.) R. C. Fuson and C. S. Marvel. OEMsr-48; Service Project No. CWS-3; OSRD No. 507. University of Illinois. April 15, 1942.

213.14 Chloroarsines

M1 Economics in the preparation of DM. (Progress Report No. 56.) Paul D. Bartlett and Saul G. Cohen. NDCrc-136; Service Project No. CWS-3; OSRD No. 118. Harvard University. July 31, 1941.

M2 A study of the preparation of the amyldichloroarsines. (Progress Report No. 330, to July 6, 1942.) R. C. Fuson. OEMsr-300; Service Project No. CWS-3; OSRD No. 824. University of Illinois. August 26, 1942.

M3 Aliphatic dichloroarsines. (Final Report No. 336, to July 25, 1942.) Cliff S. Hamilton. OEMsr-85; Service Project No. CWS-3; OSRD No. 837. University of Nebraska. August 28, 1942.

M4 The reactions of *n*-amyl-, isoamyl-, and *n*-hexyldichloroarsines in comparison with lewisite. (Progress Report No. 351, to August 19, 1942.) Paul D. Bartlett. NDCrc-136; Service Project No. CWS-3; OSRD No. 856. Harvard University. September 4, 1942.

M5 The preparation of ethyldichloroarsine and related compounds. (Progress Report to January 5, 1943.) Morris S. Kharasch. OEMsr-394; Service

Project No. CWS-3; OSRD No. 1294. University of Chicago. March 23, 1943.

M6 The preparation of ethyl dichloroarsine on a pilot plant scale. (Progress Report to June 26, 1943.) H. M. Parmalee. OEMsr-933; Service Project No. CWS-3; OSRD No. 1594. E. I. duPont de Nemours and Company, Inc. July 13, 1943.

213.2 Halides

213.21 Arsenic Trichloride

M1 Use of crude white arsenic in present Chemical Warfare Service arsenic trichloride process. John C. Woodhouse. OEMsr-656; Service Project No. CWS-9; OSRD Nos. 1378 and 1752. E. I. duPont de Nemours and Company, Inc. April 30 and August 31, 1943.

M2 Arsenic trichloride. Laboratory study of manufacture by the use of hydrogen chloride. (Progress Report to April 1, 1943.) John C. Woodhouse. OEMsr-656; Service Project No. CWS-9; OSRD No. 1381. E. I. duPont de Nemours and Company, Inc. May 3, 1943.

M3 Use of crude white arsenic in a Chemical Warfare Service arsenic trichloride plant. (Progress Report to September 11, 1943.) John C. Woodhouse. OEMsr-656; Service Project No. CWS-9; OSRD No. 3367. E. I. duPont de Nemours and Company, Inc. March 16, 1944.

M4 Pilot plant for arsenic trichloride using hydrogen chloride process. (Final Report to December 31, 1944. Blueprints included.) John C. Woodhouse, W. T. Grace and others. OEMsr-656; Service Project No. CWS-9; OSRD No. 4880. E. I. duPont de Nemours and Company, Inc. April 1, 1945.

213.22 Arsanthrene Dichloride

M1 The preparation of 5,10-dichloro-5,10-dihydro-arsanthrene. (Progress Report No. 67, to August 1, 1941.) Cliff S. Hamilton. NDCrc-16; Service Project No. CWS-3; OSRD No. 129. University of Nebraska. September 4, 1941.

214 Selenium

M1 Selenides. (Progress Report to August 1, 1944.) Charles D. Hurd. OEMsr-135; Service Project No. CWS-4; OSRD No. 4051. Northwestern University. August 22, 1944.

M2 [Preparation and properties of] 2-chlorovinyl-selenium chloride, selenium oxychloride, 2-chloroethaneseleninyl chloride and ethaneseleninyl chloride hydrate. (Progress Report to September, 1944.) Charles D. Hurd. OEMsr-135; Service Project No. CWS-4; OSRD No. 4175. Northwestern University. September 29, 1944.

215 Cadmium

M1 Preparation of cadmium salts and organo-cadmium compounds. (Final Report No. 332, to April 10, 1942.) Henry Gilman. OEMsr-97; Service Project

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No. CWS-4; OSRD No. 846. Iowa State College. August 26, 1942.

- 216 **Tin**
M1 Organo-tin compounds. (Progress Report No. 236, to March 15, 1942.) Henry Gilman. OEMsr-97; Service Project No. CWS-4; OSRD No. 548. Iowa State College. May 2, 1942.
- 217 **Thallium**
M1 Thallium compounds. (Progress Report to February 26, 1943.) Henry Gilman. OEMsr-97; Service Project No. CWS-4; OSRD No. 1504. Iowa State College. June 9, 1943.
- 218 **Lead**
M1 Organo-lead compounds as sternutators. (Progress Report to December 15, 1942.) Henry Gilman. OEMsr-97; Service Project No. CWS-4; OSRD No. 1517. Iowa State College. June 16, 1943.
- 219 **Miscellaneous Metalloid and Metal-Containing Compound Research**
M1 The thickening of HS-M1 mixtures, and a photographic study of the impact of HS drops on cloth. (Progress Report No. 279.) Duncan A. MacInnes, Donald Belcher and Andrew Tait. OEMsr-130; Service Project Nos. CWS-12 and NL-B36; OSRD No. 667. Rockefeller Institute for Medical Research. June 15, 1942.
M2 Letter to Dr. Franklin C. McLean. Subject: [Five new metallic-organic compounds.] Henry Gilman. [Iowa State College.] August 4, 1942.
M3 Selenonium and sulfonium halides. (Progress Report to December 8, 1943.) Charles D. Hurd. OEMsr-135; Service Project No. CWS-4; OSRD No. 3064. Northwestern University. January 1, 1944.
M4 Organic arsenicals and other toxic agents. (Progress Report to September 1, 1944.) Cliff S. Hamilton, E. J. Cragoe, Jr. and others. OEMsr-85; Service Project Nos. CWS-3 and CWS-4; OSRD No. 4533. University of Nebraska. January 1, 1945.
- 220 **Nitrogen Compounds**
(See also: 320)
- 221 **Amines**
M1 The reaction of amines with N-mustards. Samuel Gurin, Dana I. Crandall and Adelaide M. Delluva. OEMcmr-108. University of Pennsylvania, Medical School. May 14, 1943.
- 221.1 **Nitrogen Mustards (HN-1, HN-2 and HN-3)**
M1 The beta-chloroethylamines. Kinetics of displacement, hydrolysis and dimerization of beta-chloroethyldiethylamine, methyl-bis-beta-chloroethylamine and tris-beta-chloroethylamine and their similarity to the reactions of HS. (Progress Report No. 384, to September 18, 1942.) Paul D. Bartlett. NDCrc-136; Service Project No. CWS-4; OSRD No. 942. Harvard University. October 7, 1942.
- M2** The preparation and stability of [Compound] 1149. (Progress Report No. 473, to December 1, 1942.) George H. Coleman. OEMsr-223; Service Project No. CWS-4; OSRD No. 1158. State University of Iowa. December 9, 1942.
- M3** Reactions of TL-146 with hexamethylene tetramine. Samuel Gurin, Adelaide M. Delluva and Dana I. Crandall. OEMcmr-108. [University of Pennsylvania, Medical School.] April 1, 1943.
- M4** The preparation of β -chloroethyl- β' -hydroxyethyl methylamine and its polymerization products. (Progress Report to March 15, 1943.) Ralph L. Shriner. OEMsr-195; Service Project No. CWS-4; OSRD No. 1358. Indiana University. April 21, 1943.
- M5** The preparation and stability of nitrogen mustards. (Progress Report to June 21, 1943.) George H. Coleman. OEMsr-223; Service Project No. CWS-4; OSRD No. 1670. State University of Iowa. July 3, 1943.
- M6** The β -chloroethylamines. A further kinetic analysis of the dimerization and hydrolysis of methyl-bis- β -chloroethylamine. Further observations on diethyl- β -chloroethylamine and tris- β -chloroethylamine. (Progress Report [to] June 15, 1943.) Paul D. Bartlett, Sidney D. Ross and C. Gardner Swain. NDCrc-136; Service Project No. CWS-4; OSRD No. 1570. Harvard University. July 6, 1943.
- M7** The volatilities, vapor pressures and some physical constants of twelve nitrogen mustards. (Progress Report to June 29, 1943.) C. Ernst Redemann, Ralph B. Fearing and Dora Benedict. NDCrc-132; Service Project No. CWS-2; OSRD No. 1663. University of Chicago. August 2, 1943.
- M8** A kinetic study of ethyl-bis- β -chloroethylamine, HN-1, in water-acetone solutions and a comparison with other - β -chloroethylamines. (Progress Report to June 10, 1943.) Paul D. Bartlett, C. Gardner Swain and others. NDCrc-136; Service Project No. CWS-4; OSRD No. 1892. Harvard University. October 6, 1943.
- M9** [Reactions of nitrogen mustards.] (Informal Monthly Progress Report Nos. [10,] 12, 13, 14, 16, 17, 20, 22 and 24.) Barnett Cohen, Ervin R. Van Artsdalen and Marie E. Perkins. OEMsr-532. [Johns Hopkins University.] November 10, 1943; January 10, February 10, March 10, June 10, September 10, November 10, 1944 and January 10, 1945.
- M10** Preparation and stability of the nitrogen mustards. (Progress Report to January 8, 1944.) George H. Coleman, Joseph E. Callen and others. OEMsr-223; Service Project No. CWS-4; OSRD No. 3551. State University of Iowa. April 27, 1944.
- M11** Studies of the kinetics of the β -chloroethylamines and their products in dilute aqueous solution. Barnett Cohen and Ervin R. Van Artsdalen.

- OEMsr-532; Service Project No. CWS-2; OSRD No. 3557. Johns Hopkins University. May 1, 1944.
- M12** The chemistry of three nitrogen mustards as water contaminants. Arthur M. Buswell and Charles C. Price. OEMsr-593; Service Project No. CWS-14; OSRD No. 3669. University of Illinois. May 24, 1944.
- M13** Storage characteristics and stabilization of HN-1 and HN-3. (Progress Report to June 1, 1944.) John C. Woodhouse, A. S. Weygandt and others. OEMsr-656; Service Project No. CWS-13; OSRD No. 3928. E. I. duPont de Nemours and Company, Inc. August 1, 1944.
- M14** Microscopical properties of derivatives of nitrogen mustards with picric acid. Clyde W. Mason, George B. DeLaMater and Franklin A. Hamm. [OEMsr-842;] OSRD No. 3995. Cornell University. [August 9, 1944.]
- M15** The preparation and stability of nitrogen mustards and related compounds. (Progress Report to September 10, 1944.) George H. Coleman, Joseph E. Callen and others. OEMsr-223; Service Project No. CWS-4; OSRD No. 4303. State University of Iowa. November 2, 1944.
- M16** Chemical reactions of the nitrogen mustards. (Progress Report to November 15, 1944. Supplement to OSRD No. 1855.) Max Bergmann, Joseph S. Fruton and others. OEMsr-313; Service Project No. CWS-2; OSRD No. 4535. Rockefeller Institute for Medical Research. January 2, 1945.
- 221.2 Compounds 1070, 1130 and 1133**
- M1** [Preparation and characteristics of Compounds 1130 and 1070.] ([Monthly Progress Reports covering the period from] April 15 to June 15, 1942.) (n.a.) State University of Iowa.
- M2** Preparation and stability studies of [Compounds] 1130, 1070 and closely related compounds. (Progress Report No. 379, to September 1, 1942.) George H. Coleman. OEMsr-223; Service Project No. CWS-4; OSRD No. 914. State University of Iowa. October 2, 1942.
- M3** The stabilities of [Compounds] 1070 and 1130. Preparations and properties of these substances. (Progress Report No. 392, to September 15, 1942.) Morris S. Kharasch. OEMsr-394; Service Project No. CWS-4; OSRD No. 1008. University of Chicago. October 12, 1942.
- M4** Summary work on [Compounds] 1070, 1130 and related compounds in Section B-3, NDRC. (Progress Report No. 404, to September 15, 1942.) C. S. Marvel. OEMsr-564; Service Project Nos. CWS-4, NL-B31 and others; OSRD No. 981. University of Illinois. October 22, 1942.
- M5** The preparation and stability of [Compound] 1133. (Progress Report No. 445, to November 20, 1942.) George H. Coleman. OEMsr-223; Service Project No. CWS-4; OSRD No. 1148. State University of Iowa. December 7, 1942.
- 221.3 Diamines**
- M1** N,N,N,N-tetra(β -chloroethyl) ethylene-diamine dihydrochloride. (Informal Report No. 7.) Ralph L. Shriner. OEMsr-195; Service Project No. CWS-4. Indiana University. September 21, 1943.
- 221.4 Alkanol and Ethanol Amines**
- M1** New methods for synthesizing alkanolamines for use in vesicants. Exploratory studies on the synthesis of ethanolamines from formaldehyde and hydrogen cyanide. (Progress Report to May 11, 1943.) D. J. Loder, William F. Gresham and others. OEMsr-574; Service Project No. CWS-4; OSRD No. 1960. E. I. duPont de Nemours and Company, Inc. November 1, 1943.
- M2** New methods for synthesizing alkanolamines for use in vesicants. Synthesis of ethanolamines by continuous hydrogenation from formaldehyde and hydrogen cyanide. (Final Report to May 26, 1943.) D. J. Loder, Arthur G. Weber and others. OEMsr-574; Service Project No. CWS-4; OSRD No. 1961. E. I. duPont de Nemours and Company, Inc. November 2, 1943.
- 221.5 Vanillylamine**
- M1** N-vanillylundecylenamide and N-vanillylmandelamide. (Progress Report No. 425, to November 1, 1942.) Homer Adkins. OEMsr-304; Service Project No. CWS-4; OSRD No. 1017. University of Wisconsin. November 12, 1942.
- 221.6 Miscellaneous Amines**
- M1** [Stability studies of various substances.] ([Monthly Progress Report covering the period from] August 15 to September 15, 1942.) George H. Coleman, J. Carnes and others. State University of Iowa.
- 222 Carbamates**
- M1** The synthesis of toxic carbamates of aminoalcohols (doryl homologs and analogs). (Progress Report to November 15, 1944.) L. Kaplan and Carl R. Noller. OEMsr-136; Service Project Nos. CWS-4 and CWS-29; OSRD No. 4662. Stanford University. February 5, 1945.
- M2** N-substituted aryl carbamates [Part] III; and related miscellaneous investigations. (Progress Report to January 10, 1945.) Ralph L. Shriner, J. C. Speck, Jr. and others. OEMsr-195; Service Project Nos. CWS-4 and CWS-29; OSRD No. 4769. Indiana University. March 20, 1945.
- M3** Carbamates. Henry Gilman. OEMsr-97. Iowa State College. [April 2, 1946.]
- 222.1 N-alkyl Carbamates**
- M1** The preparation and properties of alkyl N-nitroso-N-alkylcarbamates and related compounds. (Progress Report No. 469, to November 25, 1942.) Morris S. Kharasch. OEMsr-394; Service Project No. CWS-4; OSRD No. 1117. University of Chicago. December 9, 1942.

- M2** N-alkyl carbamates of aminophenols and some sulfur-containing analogs. (Report to April 18, 1944.) Elliot R. Alexander and Arthur C. Cope. Service Project No. CWS-29; OSRD No. 3877. Columbia University and University of Chicago. July 11, 1944.
- M3** N-alkyl carbamates of 4-substituted-3,5-dimethylphenols. (Progress Report to June 1, 1944.) Ralph L. Shriner, C. R. Russell and J. C. Speck, Jr. OEMsr-195; Service Project Nos. CWS-4 and CWS-29; OSRD No. 5003. Indiana University. April 28, 1945.

222.2 Methyl Carbamates

- M1** Letter to F. C. McLean. Subject: N-(beta-chloroethyl)-methyl carbamate. H. M. Parmelee. E. I. duPont de Nemours and Company, Inc. August 30, 1943.
- M2** Carbamates of aminoalcohols and aminophenols. (Informal Monthly Progress Report covering period from May 6 to June 8, 1944.) Carl R. Noller, C. D. Heaton and L. Kaplan. OEMsr-136. [Stanford University.] June 8, 1944.
- M3** Derivatives of certain dialkylaminophenyl-N-methyl carbamates. (Progress Report to June 15, 1944.) Cliff S. Hamilton. Service Project No. CWS-29; OSRD No. 3883. July 13, 1944.
- M4** Preliminary engineering study of plant to manufacture N-nitroso-(-beta-chloroethyl)-methyl carbamate. (Final Report to December 31, 1943.) H. W. Elley, T. W. Stricklin and others. OEMsr-761; Service Project No. CWS-4; OSRD No. 3913. E. I. duPont de Nemours and Company, Inc. August 1, 1944.
- M5** [The preparation of] *m*-diethylaminophenyl N-methyl carbamate and certain of its salts. Cliff S. Hamilton, E. J. Cragoe and others. OEMsr-85; Service Project No. CWS-29; OSRD No. 4534. University of Nebraska. January 2, 1945.
- M6** Synthesis of chemical warfare toxic and vesicant agents. Non-volatile toxic agents. Preparation of the methochloride of *m*-diethylaminophenyl methyl carbamate. (Progress Report to October 1, 1944.) Paul L. Salzberg, W. A. Lazier and others. OEMsr-549; Service Project Nos. CWS-4 and CWS-29; OSRD No. 5980. E. I. duPont de Nemours and Company, Inc. February 12, 1946.

222.3 Nitrosocarbamates

- M1** The preparation of 2-fluoroethyl nitrosocarbamates. (Informal Report No. 6.) Morris S. Kharasch, S. Weinhouse and Alan R. Stiles. OEMsr-394; Service Project No. CWS-4. University of Chicago. November 24, 1943.

222.4 Quaternary Salts

- M1** Substituted carbamates. (Informal Monthly Progress Report [covering the period from] December 10, 1944 to January 10, 1945.) Ralph L. Shriner

and J. C. Speck, Jr. OEMsr-195. [Indiana University.] January 10, 1945.

- M2** N-substituted carbamates of phenols containing a quaternary ammonium group. [Part] I, Derivatives of *m*-dialkylaminophenols and 2-methyl-5-dialkylaminophenols. (Progress Report to December 1, 1944.) Ralph L. Shriner, J. C. Speck, Jr. and others. OEMsr-195; Service Project Nos. CWS-4 and CWS-29; OSRD No. 4660. Indiana University. February 5, 1945.
- M3** N-substituted carbamates of phenols containing a quaternary ammonium group. [Part] II, Derivatives of thymol and carvacrol. (Progress Report to December 10, 1944.) Ralph L. Shriner, J. C. Speck, Jr. and others. OEMsr-195; Service Project Nos. CWS-4 and CWS-29; OSRD No. 4661. Indiana University. February 5, 1945.
- M4** Quaternary salts of N-alkylcarbamates of aminophenols, prostigmine analogs. (Progress Report to December 1, 1944.) C. D. Heaton, L. Kaplan and Carl R. Noller. OEMsr-136; Service Project Nos. CWS-4 and CWS-29; OSRD No. 4663. Stanford University. February 5, 1945.
- M5** Derivatives of *m*-alkylphenols, quaternary salts of carbamates. (Progress Report to February 10, 1945.) Lee Irvin Smith, C. F. Koelsch and Vaughn Engelhardt. OEMsr-372; Service Project Nos. CWS-4 and CWS-29; OSRD No. 5017. University of Minnesota. May 1, 1945.
- M6** A study of the decomposition of the carbamates of certain aminophenol quaternary salts. (Progress Report to November 10, 1944.) Paul D. Bartlett, Hyp J. Dauben, Jr. and others. NDCrc-136; Service Project No. CWS-29; OSRD No. 6353. Harvard University. November 27, 1945.
- M7** The preparation of quaternary salts of N-methylcarbamates of dialkylaminophenols. (Progress Report to June, 1945.) Homer Adkins, Harry P. Schultz and others. OEMsr-304; Service Project No. CWS-29; OSRD No. 6085. University of Wisconsin. December 1, 1945.

222.5 Carbamic Acids

- M1** The preparation and properties of KB-10 (TL-154) and KB-16 (TL-186). (Informal Report No. 8.) Morris S. Kharasch. [OEMsr-394.] University of Chicago. May 8, 1942.
- M2** The determination of the volatilities and vapor pressures of TL-186 and TL-154. (Special Report No. 6.) George J. Rotariu and Henry E. Bent. University of Chicago. August 24, 1942.
- M3** Thermal stability of KB-16. (Formal Progress Report No. 3.) R. F. Deese, Jr., I. W. Dobratz and K. C. Johnson. Research Project No. PDRc-456. E. I. duPont de Nemours and Company, Inc. October 1, 1942.
- M4** N-nitroso-N-chloroethylcarbamic acid methyl ester, TL-186. (Progress Report to January 1, 1943.) William H. Stein and Max Bergmann. OEMsr-

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313; Service Project No. CWS-2; OSRD No. 1172. Rockefeller Institute for Medical Research. February 2, 1943.

- M5** Thermal data on KB-14 and KB-16. (Final Report to April 15, 1943.) Hugh M. Huffman. OEMsr-199; Service Project No. CWS-7; OSRD No. 1477. California Institute of Technology. June 1, 1943.

- M6** Summary of work on KB-16. (Report to October 1, 1943.) Compiled by: Marshall Gates. Service Project No. CWS-4; OSRD No. 2009. November 11, 1943.

- M7** The pilot plant preparation of TL-1217, TL-1299 and intermediates. (Progress Report to September 30, 1945.) Russell L. Jenkins and Edgar E. Hardy. OEMsr-845; Service Project Nos. CWS-4 and CWS-29; OSRD No. 6117. Monsanto Chemical Company. October 25, 1945.

223 Cyanogens and Cyanates

223.1 Cyanogen Chloride (CC and CK)

- M1** Stabilization of cyanogen chloride. (Division 10. [Parts] VIII to XI and XIII to XX. Informal Report Nos. 10.4-47, -50, -52, -58, -66, -68, -70, -72, -76 and -78 to -80.) Anton B. Burg, Don L. Armstrong and others. OEMsr-1004; Service Project Nos. CWS-7 and CWS-26. University of Southern California. January 15 to April 15, 1944 and June 15, 1944 to January 14, 1945.

- M2** Studies on the determination of the acidity of CC. (Progress Report to July 5, 1944.) John H. Yoe and Lyle G. Overholser. OEMsr-139; Service Project No. CWS-6; OSRD No. 3914. University of Virginia. July 18, 1944.

- M3** Stabilization of CC and CK. (Second through Eighth Progress Reports.) Morris S. Kharasch. [OEMsr-394.] [University of Chicago.] July 28, September 20, October 21, October 23 and November 27, 1944; January 5 and March 5, 1945.

- M4** Gravimetric determination of water, trimer and residue in cyanogen chloride. (Progress Report to September 18, 1944.) John H. Yoe and Charles H. Lindsley. OEMsr-139; Service Project No. CWS-6; OSRD No. 4158. University of Virginia. September 21, 1944.

- M5** Some aspects of the behavior of CC as a water contaminant. (Progress Report to October 20, 1944.) Charles C. Price, T. E. Larson and others. OEMsr-593; Service Project No. CWS-6; OSRD No. 4287. University of Illinois. October 26, 1944.

- M6** Determination of iron in CK, cyanuric chloride and CK polymer. (Progress Report to December 9, 1944.) John H. Yoe, Lyle G. Overholser and Alfred R. Armstrong. OEMsr-139; Service Project No. CWS-6; OSRD No. 4494. University of Virginia. December 22, 1944.

- M7** Fractionation of residues from degradation of cyanogen chloride. (Final Report to February 28, 1945.) John H. Yoe, Charles H. Lindsley and

Alfred R. Armstrong. OEMsr-139; Service Project No. CWS-6; OSRD No. 4990. University of Virginia. April 26, 1945.

- M8** Stabilization of CK. (Progress Report to July 9, 1945.) Morris S. Kharasch, Alan R. Stiles and others. OEMsr-394; Service Project No. CWS-4; OSRD No. 5467. University of Chicago. August 21, 1945.

223.2 Hydrocyanic Acid (AC)

- M1** Determination of water in hydrocyanic acid. (Progress Report to November 23, 1944.) John H. Yoe and Charles H. Lindsley. OEMsr-139; Service Project No. CWS-6; OSRD No. 4410. University of Virginia. November 30, 1944.

223.3 Miscellaneous Cyanogens and Cyanates

- M1** The preparation of *o*-cyanophenacyl chloride. (Informal Report No. 2.) R. C. Fuson. OEMsr-300; Service Project No. CWS-4. University of Illinois. May 19, 1943.

- M2** New toxic gases, [Parts] XII to XIV. Flame-damping of hydrogen cyanide, [Parts I] to VII. Stabilization of cyanogen chloride, [Parts I] III to VII and XII. (Division 10. Informal Report Nos. 10.3B-25 and -30; 10.4-34, -37, -39, -44 and -61, covering the periods from June 15 to December 14, 1943 and April 15 to May 15, 1944.) Anton B. Burg, Don L. Armstrong and others. NDCrc-113, NDCrc-1004 and OEMsr-1004; Service Project Nos. CWS-26 and CWS-7. University of Southern California.

- M3** The preparation of isocyanates, cyanuric acid and Decontaminant 40. (Progress Report to September 30, 1945.) Russell L. Jenkins and Edgar E. Hardy. OEMsr-845; Service Project Nos. CWS-4 and NL-B30; OSRD No. 6390. Monsanto Chemical Company. December 31, 1945.

224 Heterocyclic Nitrogen Compounds

- M1** Letter to Franklin C. McLean. Subject: [Properties of N- β -chloroethylcarbazole.] Henry Gilman. [Iowa State College.] April 7, 1942.

- M2** Letter to Dr. Franklin C. McLean. Subject: [Compounds submitted to the Toxicity Laboratory for evaluation.] Morris S. Kharasch. [University of Chicago.] April 17, 1943.

- M3** The preparation for toxicity tests of some heterocycles containing a nitrogen atom common to two fused rings. (Progress Report to August 1, 1944.) Carl R. Noller and L. Kaplan. OEMsr-136; Service Project No. CWS-4; OSRD No. 4194. Stanford University. September 27, 1944.

225 Nitriles

- M1** Acrylonitrile and related compounds. (Informal Report No. 3.) Lee Irvin Smith. OEMsr-372; Service Project No. CWS-4. University of Minnesota. June 22, 1943.

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- 226 **Hydrazines**
M1 Microscopical properties of 2,4-dinitrophenylhydrazine derivatives of certain chemical warfare agents. (Progress Report to December 9, 1944.) Clyde W. Mason and George B. DeLaMater. OEMsr-842; Service Project No. CWS-6; OSRD No. 4470. Cornell University. December 15, 1944.
- 227 **Olefines**
M1 The preparation and properties of some nitro-olefine derivatives. The determination of vapor pressures and crystal densities of organic compounds. M. L. Wolfrom. OEMsr-161; Service Project No. CWS-4; OSRD No. 1568. Ohio State University. July 3, 1943.
- 228 **Halonitroso Compounds**
M1 Halonitroso compounds. (Informal Report No. 1, for the period [from] September 15, 1942 to March 15, 1943.) R. C. Fuson. OEMsr-300; Service Project No. CWS-4. University of Illinois. March 27, 1943.
- 229 **Miscellaneous Nitrogen Compounds**
M1 The preparation of certain nitrogen-containing compounds for examination as chemical warfare agents. (Final Report to November 6, 1943.) M. L. Wolfrom, Stephen M. Olin and E. E. Dickey. OEMsr-161; Service Project No. CWS-4; OSRD No. 2057. Ohio State University. November 25, 1943.
M2 Studies on the preparation of non-volatile toxic agents. (Final Report to December 31, 1943.) Karl A. Folkers, Richard F. Phillips and Clifford H. Shunk. OEMsr-1124; Service Project No. CWS-4; OSRD No. 4586. Merck and Company, Inc. January 17, 1945.
M3 Preparation of various types of amides and amidines and an investigation of the chlorinated derivatives thereof. (Final Report to February 7, 1944.) D. W. Kaiser. OEMsr-1096; Service Project Nos. CWS-24 and NL-B27; OSRD No. 6323. American Cyanamid Company. November 15, 1945.
- 230 **Carbon Compounds**
(See also: 330)
- 231 **Carbon-Oxygen Compounds**
- 231.1 **Esters**
M1 Synthesis of some basic esters related to choline and its derivatives. (Progress Report to December 22, 1942.) Ralph L. Shriner. OEMsr-195; Service Project No. CWS-4; OSRD No. 1356. Indiana University. April 21, 1943.
M2 Preparation of esters of α , α' -dibromo or dichlorodibasic acids. (Progress Report to June 1, 1943.) Homer Adkins. OEMsr-304; Service Project No. CWS-4; OSRD No. 1529. University of Wisconsin. June 22, 1943.
- 231.2 **Ketones and Ketenes**
M1 Direct oxidation of methyl ethyl ketone to diacetyl. Homer Adkins. OEMsr-304. [University of Wisconsin.] October 15, 1942.
M2 Letter to Dr. Crawford F. Failey. Subject: [Ketene compounds submitted for evaluation.] Cliff S. Hamilton. University of Nebraska. August 5, 1943.
M3 Experimental production of diacetyl and dimethyl glycoluril. (Final Report to June 30, 1944.) W. J. Hund. OEMsr-913; Service Project No. CWS-4; OSRD No. 4091. Shell Development Company. September 15, 1944.
M4 Ketenes. (Progress Report to August 24, 1945.) Charles D. Hurd. OEMsr-135; Service Project No. CWS-4; OSRD No. 6062. Northwestern University. October 6, 1945.
- 231.3 **Acid Halides**
- 231.31 **Phosgene (CG) and Diphosgene**
M1 The catalytic conversion of diphosgene into phosgene. (Progress Report No. 144, to December 1, 1941.) Morris S. Kharasch. OEMsr-114; Service Project No. CWS-4; OSRD No. 332. University of Chicago. January 9, 1942.
M2 The preparation of diphosgene. (Progress Report No. 212, to March 10, 1942.) Morris S. Kharasch. OEMsr-114; Service Project No. CWS-4; OSRD No. 504. University of Chicago. April 15, 1942.
M3 Catalytic conversion of diphosgene to phosgene within closed heavy metal containers. (Progress Report No. 375, to September 10, 1942.) Morris S. Kharasch. OEMsr-114; Service Project No. CWS-4; OSRD No. 899. University of Chicago. September 28, 1942.
M4 Preparation of diphosgene. (Progress Report to April 28, 1943.) S. Temple. OEMsr-655; Service Project No. CWS-4; OSRD No. 1437. E. I. duPont de Nemours and Company, Inc. May 20, 1943.
- 231.32 **Fluorobutyrate**
M1 Preparation of methyl beta-hydroxy-gamma-fluorobutyrate (KB-258) and methyl gamma-fluorocrotonate (KB-244). Morris S. Kharasch. [OEMsr-394.] [University of Chicago.] June 29, 1944.
M2 The gamma-fluorobutyrate and related toxic compounds. Morris S. Kharasch and Elwood V. Jensen. OEMsr-394. University of Chicago. July 11, 1944.
M3 The gamma-fluorobutyrate and related toxic compounds. (Progress Report to July 11, 1944.) Morris S. Kharasch and Elwood V. Jensen. OEMsr-394; Service Project No. CWS-4; OSRD No. 4008. University of Chicago. August 11, 1944.

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231.33 Carbonyl Monochloride Monofluoride

- M1** Preliminary tube tests with COClF. (Progress Report No. 454.) Roscoe G. Dickinson. NDCrc-137; Service Project Nos. CWS-7 and NL-B26; OSRD No. 1106. California Institute of Technology. December 8, 1942.

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Plant Products
(See also: 340)**231.4 Miscellaneous Carbon-Oxygen Compounds**

- M1** The sternutatory properties of certain organic compounds. (Progress Report No. 385, to September 20, 1942.) Carl R. Noller. OEMsr-136; Service Project No. CWS-4; OSRD No. 941. Stanford University. October 7, 1942.
- M2** Hydroximyl chlorides. Charles D. Hurd. Northwestern University. November 26, 1945.

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Compound W

- M1** Pilot plant production of [Compound] W. (Progress Report to April 1, 1943.) F. W. Blair and O. H. Alderks. OEMsr-843; Service Project No. CWS-4; OSRD No. 1563. Proctor and Gamble Company. July 2, 1943.
- M2** Isolation of a toxic crystalline protein from PGW. (Progress Report to July 15, 1944.) John R. Northrop and Moses Kunitz. OEMsr-129; Service Project No. CWS-2 and CWS-4; OSRD No. 4537. Rockefeller Institute for Medical Research. January 2, 1945.
- M3** The preparation and purification of amorphous [Compound] W. (Progress Report to February 28, 1945.) Alsoph H. Corwin, Sally H. Dieke and others. OEMsr-681; Service Project No. CWS-4; OSRD No. 4947. Johns Hopkins University. April 25, 1945.
- M4** Consulting work on [Compound] W. (Final Report to June 28, 1945.) Paul L. Salzberg, J. L. Keats and others. OEMsr-1080; Service Project No. CWS-4; OSRD No. 5437. E. I. duPont de Nemours and Company, Inc. August 11, 1945.
- M5** The preparation and purification of crystalline [Compound] W. (Progress Report to February 28, 1945.) Alsoph H. Corwin, J. Gordon Erdman and Wilhelm R. Frisell. OEMsr-681; Service Project No. CWS-4; OSRD No. 6404. Johns Hopkins University. December 18, 1945.
- M6** The chemistry of the W-bean proteins. (Progress Report to February 28, 1945.) Alsoph H. Corwin, Wilhelm R. Frisell and others. OEMsr-681; Service Project No. CWS-4; OSRD No. 6435. Johns Hopkins University. January 2, 1946.
- M7** Chemical properties of [Compound] W relating to toxoid preparation. (Final Report to February 28, 1945.) Alsoph H. Corwin, Mark Nickerson and J. Gordon Erdman. OEMsr-681; Service Project No. CWS-4; OSRD No. 6437. Johns Hopkins University. January 3, 1946.
- M8** Pilot plant preparation of dispersible [Compound] W. (Final Report to August 31, 1945.) H. L. Craig and O. H. Alderks. OEMsr-843; Service Project No. CWS-4; OSRD No. 6392. Proctor and Gamble Company. January 7, 1946.
- M9** The preparation and properties of crystalline [Compound] W. (Progress Report to April 1, 1946.) Angelo E. Benaglia, Milton Levy and R. Keith Cannan. OEMsr-1050; Service Project Nos. CWS-2 and CWS-29; OSRD No. 6656. New York University, College of Medicine. June 1, 1946.

232 Fluorocarbons

- M1** Fluorocarbons. (Progress Report No. 394, to July 1, 1942.) William T. Miller and Albert L. Henne. OEMsr-237 and OEMsr-162; Service Project No. NL-B41; OSRD No. 1023. Cornell University and Ohio State University. October 14, 1942.
- M2** Fluorocarbons and related compounds. (Final Report to June 30, 1943.) Albert L. Henne. OEMsr-162; Service Project No. NL-B41; OSRD No. 1792. Ohio State University. September 10, 1943.
- M3** Aromatic fluorocarbons. (Final Report to January 30, 1943.) Frank H. Reed and G. C. Finger. OEMsr-469; Service Project No. NL-B41; OSRD No. 3163. University of Illinois. January 19, 1944.
- M4** Fluorocarbons. (Final Report to June 30, 1943.) William T. Miller, R. E. Ehrenfeld and others. OEMsr-237; Service Project No. NL-B41; OSRD No. 3590. Cornell University. May 10, 1944.
- M5** Fluorocarbons. (Final Report to June 30, 1943.) Robert D. Fowler and William B. Burford, III. OEMsr-332; Service Project No. NL-B41; OSRD No. 3898. Johns Hopkins University. July 17, 1944.
- M6** Organic compounds containing fluorine. Morris S. Kharasch. OEMsr-394. [University of Chicago.] June 13, 1945.
- M7** Organic compounds containing fluorine. (Progress Report to June 13, 1945.) Morris S. Kharasch. OEMsr-394; Service Project No. CWS-4; OSRD No. 5281. University of Chicago. June 28, 1945.

233 Carbon Monoxide Pentamer

- M1** Synthesis of chemical warfare toxic and vesicant agents. Carbon monoxide pentamer. (Progress Report to February 9, 1945.) David C. England and B. W. Howk. OEMsr-549; Service Project No. CWS-4; OSRD No. 5562. E. I. duPont de Nemours and Company, Inc. September 7, 1945.

234 Ethylene and Acetylene Derivatives

- M1** The preparation for toxicity tests of some ethylene and acetylene derivatives. (Progress Report to September 1, 1944.) C. D. Heaton, E. W. Torbohn

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242 Camphor Compounds

- M1** The preparation of some derivatives of *d*-camphor. (Informal Report No. 3.) M. L. Wolfrom. OEMsr-161; Service Project No. CWS-4. Ohio State University. July 13, 1943.
- M2** The preparation of *d*-camphor oxime and isonitroso-*d*-camphor. (Informal Report No. 7, to July, 1943.) M. L. Wolfrom. OEMsr-161; Service Project No. CWS-4. Ohio State University. November 24, 1943.

243 Miscellaneous Plant Products

- M1** Synthesis of compounds related to urushiol, laccol, rhengol and thitsiol. (Final Report No. 337, to May 15, 1942.) Ralph L. Shriner. OEMsr-195; Service Project No. CWS-4; OSRD No. 831. University of Indiana. August 28, 1942.

250 Research Relative to Various Compounds**251 Boron Compounds**

- M1** Detailed directions for the preparation of triethylboron. Henry Gilman. [Iowa State College, July, 1942(?)]

252 Fluorine and Fluorine Compounds

(See also: 350)

- M1** An electrolytic cell designed for fluorine production. (Final Report [covering the period from] September 1, 1941 to August 31, 1942.) J. H. Simons. OEMsr-159; Service Project No. NL-B35; OSRD No. 4199. Pennsylvania State College. July 24, 1942.
- M2** Vapor pressures of diethyl fluorophosphate, ethyl difluorophosphate, dimethyl fluorophosphate, ethyl fluorosulfonate and trimeric phosphonitrilic chloride. (Informal Report No. CLXXX, for the period [from] July 15 to August 15, 1942.) L. F. Audrieth and John C. Bailar, Jr. OEMsr-299; Service Project No. CWS-7. University of Illinois. August 15, 1942.
- M3** The study of laboratory and pilot plant procedures for the preparation of diisopropyl fluorophosphate, methyl fluoroacetate and 2-fluoroethanol. (Informal Monthly Report Nos. 13 and 14 [covering the period from] January 11 to March 10, 1944.) Russell L. Jenkins, Edgar E. Hardy and others. OEMsr-845. [Monsanto Chemical Company.]
- M4** A summary of fluorine compounds prepared or examined in the US, to January 10, 1944. Marshall Gates. February 17, 1944.
- M5** Microscopical properties of derivatives of fluorine agents. (Progress Report to February 10, 1945.) Clyde W. Mason and George B. DeLaMater. OEMsr-842; Service Project No. CWS-6; OSRD No. 4716. Cornell University. February 15, 1945.

252.1 Methyl Fluoroacetate (AF-1, MFA)

- M1** Methyl fluoroacetate (AF-1, MFA, TL-551 [and] T.1202). Summary of data on the physical, chemi-

cal, toxicological and pathological properties of methyl fluoroacetate and related compounds. (Informal Memorandum No. 3.) Birdsey Renshaw, Marshall Gates and Homer W. Smith. May 15, 1944.

- M2** Some aspects of the behavior of the fluoroacetates and fluoroethanol as water contaminants. (Progress Report to February 28, 1945.) Charles C. Price and William G. Jackson. OEMsr-593; Service Project No. CWS-6; OSRD No. 5452. University of Illinois. August 17, 1945.

253 Hydrogen Peroxide

- M1** The preparation of hydrogen peroxide through the cyclic reduction and oxidation of 2-ethylanthraquinone. (Progress Report to September 30, 1945.) Harry Schultz, James Carnahan and Homer Adkins. OEMsr-304; OSRD No. 6087. University of Wisconsin. November 20, 1945.

254 Metal Corrosion

- M1** The corrosion of steel by M-1, lewisite. (Final Report No. 319, to June 10, 1942.) Paul D. Bartlett. NDCrc-136; Service Project No. CWS-13; OSRD No. 799. Harvard University. August 14, 1942.
- M2** The corrosion of steel by 50% HS—50% M-1 mixture. (Progress Report No. 341, to June 13, 1942.) Paul D. Bartlett. NDCrc-136; Service Project No. CWS-13; OSRD No. 825. Harvard University. August 14, 1942.
- M3** The corrosion of metals by mustard gas. (Progress Report No. 331, to July 30, 1942.) C. S. Marvel and R. C. Fuson. OEMsr-48 and OEMsr-300; Service Project No. CWS-13; OSRD No. 855. University of Illinois. August 26, 1942.
- M4** Corrosion of steel, brass and solder by pure 1070 and pure 1130 [compounds]. (Progress Report No. 343, to August 5, 1942.) Paul D. Bartlett. NDCrc-136; Service Project No. CWS-13; OSRD No. 833. Harvard University. August 31, 1942.
- M5** The corrosion of steel by 50% HS (TG)—50% M-1 (HgCl₂) mixture. (Progress Report No. 342, to August 6, 1942.) Paul D. Bartlett. NDCrc-136; Service Project No. CWS-13; OSRD No. 835. Harvard University. August 31, 1942.
- M6** Behavior of chemical agents M-1, HS, MS and FS upon storage in contact with Monel metal. (Progress Report to May 26, 1943.) John C. Woodhouse. OEMsr-656; Service Project No. CWS-13; OSRD No. 1516. E. I. duPont de Nemours and Company, Inc. June 16, 1943.

255 Various Combinations of Compounds

- M1** Letter to Dr. C. S. Marvel. Subject: [Phosphorus and arsenic derivatives, nitrogen derivatives and malodorants.] Morris S. Kharasch. [University of Chicago.] March 9, 1942.
- M2** [Further investigation of chemical warfare toxic

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- agents.] Monthly report on PA. Morris S. Kharasch. OEMsr-222. [University of Chicago.] March 16, 1942.
- M3** [Determination of Compounds 1070 and 1130; yeast research and SH groups of denatured proteins.] Report to Committee B4-C. John H. Northrop. May 18, 1942.
- M4** [Compounds prepared and submitted for evaluation to the Toxicity Laboratory.] Monthly report on PA and NA. Morris S. Kharasch. [OEMsr-394.] [University of Chicago.] June 15, 1942.
- M5** [Lethal gases.] ([Monthly] Report [for the period from August 15 to] September 15, 1942.) R. C. Fuson. OEMsr-300. [University of Illinois.]
- M6** [Carbamates.] Monthly reports on NA. Morris S. Kharasch. [OEMsr-394.] [University of Chicago.] September 15, 1942; December 15, 1942 to October 9, 1943; December 9, 1943 to May 9, 1944; August 10, 1944 and November 8, 1944.
- M7** Letter to Dr. Franklin C. McLean. Subject: [Compounds submitted to the Toxicity Laboratory for evaluation.] Morris S. Kharasch. [University of Chicago.] December 11, 1942.
- M8** [The preparation of special chlorine-containing organic compounds.] (Informal Monthly Progress Report, covering the period [from] February 10 to March 10, 1943.) Ralph L. Shriner and M. E. Synerholm. OEMsr-195. Indiana University.
- M9** The synthesis of organic compounds of sulfur nitrogen and chlorine. (Informal monthly progress reports.) R. C. Fuson, Charles C. Price and others. OEMsr-300. [University of Illinois.] February 10 and October 10, 1943; September 10 and October 10, 1944.
- M10** The preparation of compounds for pharmacological testing. (Informal Monthly Progress Reports [covering the period from] April 10 to July 10, 1943.) M. L. Wolfrom, S. M. Olin and E. E. Dickey. OEMsr-161. [Ohio State University.]
- M11** [Preparation and reactions of various chemical warfare substances.] (Informal Monthly Progress Reports covering the period [from] September 4, 1943 to March 9, 1944.) Paul D. Bartlett. NDCrc-136. Harvard University.
- M12** Preparation of toxic compounds. (Informal Monthly Progress Report Nos. 1 and 2.) Karl A. Folkers, Richard F. Phillips and Clifford H. Shunk. OEMsr-1124. Merck and Company, Inc. October 10 and November 10, 1943.
- M13** [Preparation of various chemical warfare substances.] (Monthly progress reports.) George H. Coleman, Joseph E. Callen and others. OEMsr-223. State University of Iowa. April 10 and July 10, 1944.
- M14** [Sodium fluoroacetate. Kinetics of the reaction of HN-2 chloroethylenimonium ion with propionate.] (Informal Monthly Progress Report No. 18.) Barnett Cohen and Ervin R. Van Artsdalen. OEMsr-532. [Johns Hopkins University.] July 10, 1944.
- M15** The study of laboratory and pilot plant procedures for the preparation of certain volatile and non-volatile chemical warfare agents. (Informal Monthly Report Nos. 22 and 24.) Russell L. Jenkins, Edgar E. Hardy and others. OEMsr-845. [Monsanto Chemical Company.] November 8, 1944 [and January 10 (?) 1945].

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TOXICITY STUDIES OF CHEMICAL WARFARE AGENTS

- M1** [Clinical, toxicological, pathological and physiological studies on chemical warfare agents.] (Informal monthly progress reports.) Homer W. Smith, Eles Addis and others. OEMsr-556. [New York University.] July 31 to December 21, 1942; February 10 to December 10, 1943; March 10 to November 10, 1944 and April 10, 1945.
- M2** Toxic substances. Edward Rogers and Karl A. Folkers. [OEMsr-1124.] Merck and Company, Inc. October 30, 1942.
- M3** Status report on toxicity and vesicant tests of compounds referred to the Chicago Toxicity Laboratory. (Progress Report No. 441, through November 4, 1942.) Eugene M. K. Geiling and Franklin C. McLean. NDCrc-132; Service Project No. CWS-2; OSRD No. 1052. University of Chicago. December 2, 1942.
- M4** Toxicity and vesicant tests on compounds referred to the University of Chicago Toxicity Laboratory. (Progress Report to August 1, 1944.) Hoylande D. Young, Eugene M. K. Geiling and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 4176. University of Chicago. October 3, 1944.
- M5** Status report on toxicity and vesicant tests of compounds referred to the University of Chicago Laboratory. (Progress Report to February 28, 1945. Supplement to OSRD Report No. 4176.) Eugene M. K. Geiling, R. Keith Cannan and William Bloom. NDCrc-132; Service Project No. CWS-2; OSRD No. 5305. University of Chicago. July 4, 1945.

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Metalloid and Metal-Containing Compounds

311

Phosphorous (See also: 211)

311.1

Diisopropyl Fluorophosphates (PF-3)

- M1** Studies on the ocular reactions of rabbits to diisopropyl fluorophosphates, PF-3. (Report No. 40.) Roy O. Scholz. OEMcmr-24. Wilmer Institute. September 20, 1943.
- M2** The effect of PF-3 on human eyes. (Report No. 43.) Roy O. Scholz and L. J. Wallen. OEMcmr-24. Wilmer Institute. November 22, 1943.
- M3** Summary of data on diisopropyl fluorophosphate and related compounds. (Informal Memorandum No. 4.) Homer W. Smith and Marshall Gates. [New York University.] October 1, 1944.
- M4** Pharmacology of PF-3 in the cat. (Report No. 21.)

McKeen Cattell and Harry Gold. OEMcmr-245. Cornell University, Medical College. June 16, 1945.

- M5 The physiological action of PF-3 as observed during laboratory and pilot plant investigation of this compound. Edgar E. Hardy. [OEMsr-845.] [Monsanto Chemical Company.] (n.d.)

312 Sulfur
(See also: 212)

312.1 Mustard Gas, Toxicity Effects of

- M1 The toxicity of mustard, redistilled Levinstein. (Progress Report No. 229, to March 7, 1942.) Julius M. Coon, Jules H. Last and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 527. University of Chicago. April 24, 1942.
- M2 Toxic effects of compounds related to mustard. [Part] 1, Toxic effects of mustard, mustard sulfone, sesquimustard and sesquimustard analogues. (Progress Report to March 15, 1943.) Morris A. Lipton, Clarence C. Lushbaugh and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 1391. University of Chicago. May 7, 1943.
- M3 Summary of data on Q and related sesquimustards. (Informal Memorandum No. 2.) Homer W. Smith. [OEMsr-556.] [New York University.] [March 1, 1944.]
- M4 H vapor. Summary of data on toxicology and casualty production. (Informal Memorandum No. 1.) Homer W. Smith. [OEMsr-556.] [New York University.] March 1, 1944.
- M5 The toxic action of mustard on *Nitella*. (Report to May 1, 1944.) W. J. V. Osterhout. NDCrc-151; Service Project No. CWS-2; OSRD No. 4272. [Rockefeller Institute for Medical Research.] October 23, 1944.
- M6 Biochemistry of the action of sulfur-containing vesicants. (Final Report to October 1, 1944.) Vincent du Vigneaud, F. H. Carpenter and others. OEMsr-144; Service Project No. CWS-2; OSRD No. 4841. Cornell University, Medical College. March 20, 1945.

312.11 Effects on Yeast Cells

- M1 [Inhibition of enzymatic reactions by DH.] (Informal Monthly Progress Report Nos. 6 and 7.) Carl F. Cori, Sidney P. Colowick and others. OEMsr-123. [Washington University.] July 15 and 24, 1942.
- M2 Some observations of the effect of H on the yeast cell. (Report No. 21.) V. Everett Kinsey, W. Morton Grant and others. OEMcmr-141. Harvard University, Medical School. [December (?) 1943.]
- M3 Correlation of the inhibition of cell division with binding of intracellular glutathione by H. (Report No. 23.) W. Morton Grant and V. Everett Kinsey. OEMcmr-141. Harvard University, Medical School. January 10, 1944.
- M4 Use of peracids in yeast in an attempt to oxidize

the sulfur of fixed H to the sulfone. (Report No. 27.) V. Everett Kinsey and W. Morton Grant. OEMcmr-141. Harvard University, Medical School. March 9, 1944.

- M5 A study of the reactivity of yeast DPN, ATP, adenylic acid and nicotinic acid with H. (Report No. 34.) W. Everett Kinsey and W. Morton Grant. OEMcmr-141. Harvard University, Medical School. May 23, 1944.
- M6 A study of the reactivity of yeast with several concentrations of H. (Report No. 37.) V. Everett Kinsey, W. Morton Grant and others. OEMcmr-141. Harvard University, Medical School. August 18, 1944.
- M7 A study of the reactivity of yeast with several concentrations of H in the presence and absence of NaCl. (Report No. 38.) V. Everett Kinsey, W. Morton Grant and others. OEMcmr-141. Harvard University, Medical School. August 18, 1944.
- M8 An investigation of the distribution of fixed H in yeast. (Report No. 39.) W. Morton Grant, V. Everett Kinsey and others. OEMcmr-141. Harvard University, Medical School. August 18, 1944.
- M9 Some biological aspects of the reaction of H with yeast cells. (Report No. 42.) V. Everett Kinsey and W. Morton Grant. OEMcmr-141. Harvard University, Medical School. December 28, 1944.
- M10 The effect of H on synthesis of carbohydrate by yeast. (Report No. 43.) V. Everett Kinsey and W. Morton Grant. OEMcmr-141. Harvard University, Medical School. December 28, 1944.
- M11 Observations on the permeability of normal and H-exposed yeast cells. (Report No. 44.) W. Morton Grant and V. Everett Kinsey. OEMcmr-141. Harvard University, Medical School. December 28, 1944.
- M12 Further investigation of the mechanism of irreversible H poisoning in yeast. (Report No. 46.) W. Morton Grant and V. Everett Kinsey. OEMcmr-141. Harvard University, Medical School. February 8, 1945.

312.111 Yeast Cells (Divinyl Sulfone and H)

- M1 Further studies on the relation between inhibition of rate of cell division and concentration of H and divinyl sulfone. (Report No. 30.) V. Everett Kinsey and Helen Pentz. OEMcmr-141. Harvard University, Medical School. May 11, 1944.
- M2 Injurious effects of H and divinyl sulfone on metabolism of yeast cells and results of several methods of therapy. (Report No. 31.) V. Everett Kinsey and W. Morton Grant. OEMcmr-141. Harvard University, Medical School. May 11, 1944.
- M3 The relation between the effects produced by H and divinyl sulfone on the rate of cell division and on metabolism of growing yeast cells. (Report No.

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33.) V. Everett Kinsey and Phyllis Robison. OEMcmr-141. Harvard University, Medical School. May 17, 1944.

- M4** The lethal effect of various doses of H and divinyl sulfone on yeast cells. (Report No. 49.) V. Everett Kinsey and W. Morton Grant. OEMcmr-141. Harvard University, Medical School. May 14, 1945.

312.12 Reactions with Proteins and Enzymes

- M1** The inactivation of enzymes by mustard gas. (Special Report to March 1, 1943.) R. Keith Cannan. OEMsr-556; Service Project No. CWS-2; OSRD No. 1248. New York University. March 10, 1943.
- M2** Some reactions of mustard gas with proteins and proteolytic enzymes. Max Bergmann, Joseph S. Fruton and others. OEMsr-313; Service Project No. CWS-2; OSRD No. 1439. Rockefeller Institute for Medical Research. May 21, 1943.
- M3** A study of the reaction between mustard gas and proteins. (Progress Report to June 7, 1943.) Selby B. Davis, William F. Ross and Eric G. Ball. OEMsr-86; Service Project No. CWS-2; OSRD No. 1630. Harvard University. July 22, 1943.
- M4** The action of mustard gas on certain enzymatic reactions. Ralph W. McKee, Ellen L. Marston and others. OEMsr-86; Service Project No. CWS-2; OSRD No. 1824. Harvard University. September 21, 1943.
- M5** Studies of compounds formed by reaction with H. [Part] VIII, Semi-quantitative determination of amino acids affected by reaction of H with proteins, as determined by bacteriological assay. (Report No. 22.) V. Everett Kinsey, D. Mark Hegsted and W. Morton Grant. OEMcmr-141. Harvard University, Medical School. December 1, 1943.
- M6** Reactions of H with enzymes and proteins. (Progress Report to April 1, 1944.) John H. Northrop, Roger M. Herriott and M. L. Anson. OEMsr-129; Service Project No. CWS-2; OSRD No. 3653. Rockefeller Institute for Medical Research. May 20, 1944.
- M7** Characteristics of sulfhydryl-dependent enzyme poisoning by H. [Part] I, Factors influencing the inactivation of urease by DH, semi-H, DVS, divinyl sulfoxide and silver nitrate. (Report No. 48.) W. Morton Grant and V. Everett Kinsey. OEMcmr-141. Harvard University, Medical School. March 26, 1945.
- M8** Characteristics of sulfhydryl-dependent enzyme poisoning by H. [Part] II, Additional factors influencing the inactivation of urease by DH, divinyl sulfone and silver nitrate. (Report No. 50.) W. Morton Grant and V. Everett Kinsey. OEMcmr-141. Harvard University, Medical School. May 28, 1945.
- M9** Characteristics of sulfhydryl-dependent enzyme poisoning by H. [Part] III, Toxicity of the conditions of silver treatment effective in regeneration

of cysteine from combination with DVS. (Report No. 51.) W. Morton Grant and V. Everett Kinsey. OEMcmr-141. Harvard University, Medical School. June 1, 1945.

- M10** Characteristics of sulfhydryl-dependent enzyme poisoning by H. [Part] IV, Protection of urease during silver treatment. (Report No. 52.) W. Morton Grant and V. Everett Kinsey. OEMcmr-141. Harvard University, Medical School. July 24, 1945.

312.121 Enzymatic Degradation

- M1** Studies of compounds formed by reaction with HS or semi-H and their enzymatic degradation. [Part] I, The effect of the gastro-intestinal enzymes on HS-casein as indicated by growth studies made on rats and chicks. (Report No. 13.) V. Everett Kinsey and W. Morton Grant. OEMcmr-141. Harvard University, Medical School. June 16, 1943.
- M2** Studies of compounds formed by reaction with HS or semi-H and their enzymatic degradation. [Part] II, Preparation of semi-H derivatives of cysteine and valine. (Report No. 14.) W. Morton Grant and V. Everett Kinsey. OEMcmr-141. Harvard University, Medical School. June 16, 1943.
- M3** Studies of compounds formed by reaction with HS or semi-H and their enzymatic degradation. [Part] III, Determination of the amino acids made unavailable for growth of the rat by HS treatment of casein. [Part] IV, Inability of the rat to utilize valine and cysteine from semi-H valine and semi-H cysteine, respectively. (Report No. 15.) D. G. Cogan, V. Everett Kinsey and W. Morton Grant. OEMcmr-141. Harvard University, Medical School. July 29, 1943.
- M4** Studies of compounds formed by reaction with HS or semi-H and their enzymatic degradation. [Part] V, Determination of the essential amino acids unavailable for growth of rats in an acid hydrolysate of casein reacted with HS in alkaline solution. (Report No. 18.) W. Morton Grant and V. Everett Kinsey. OEMcmr-141. Harvard University, Medical School. November 20, 1943.
- M5** Studies of compounds formed by reaction with HS or semi-H and their enzymatic degradation. [Part] VI, Determination of the essential amino acids of casein rendered unavailable for the growth of rats by reaction of casein with HS in neutral solution. (Report No. 19.) W. Morton Grant and V. Everett Kinsey. OEMcmr-141. Harvard University, Medical School. November 20, 1943.
- M6** Studies of compounds formed by reaction with HS or semi-H and their enzymatic degradation. [Part] VII, Preliminary report on the use of enzymes from soil bacteria to degrade mustard derivatives. (Report No. 20.) V. Everett Kinsey and W. Morton Grant. OEMcmr-141. Harvard University, Medical School. November 20, 1943.

312.13 Effects on Epithelial Tissues

- M1** [Effects of H on skin.] An investigation of the mode of action and therapy of chemical irritants. (Bulletin A.) (n.a.) OEMcmr-51. Yale University. March 4, 1942.
- M2** [Reactions to H in skin of normal and vitamin-deficient rats.] Survey of work already accomplished [under Contract No.] OEMcmr-M701. Maurice Sullivan. OEMcmr-M701. [Johns Hopkins University, Medical School.] April 18, 1942.
- M3** The nature and limitation of lesions produced by H substance. William T. Salter. OEMcmr-51. Yale University. July 2, 1942.
- M4** The mechanism of cutaneous injury by mustard gas. An experimental study using mustard prepared with radioactive sulfur. (Progress Report to November 10, 1943.) Frederick C. Henriques, Jr., Alan R. Moritz and others. NDCrc-169; Service Project No. CWS-2; OSRD No. 3620. Harvard University. May 9, 1944.
- M5** Additional studies pertaining to the mechanism of cutaneous injury by mustard gas. An experimental study using mustard prepared with radioactive sulfur. (Progress Report to October 1, 1945.) Alan R. Moritz, Frederick C. Henriques, Jr. and others. NDCrc-169; Service Project No. CWS-2; OSRD No. 3620A. Harvard University. October 25, 1945.

312.131 Corneal Tissue

- M1** The effect of HS vapor on certain metabolic processes of the excised intact beef cornea. (Report No. 13.) Heinz Herrmann. Wilmer Institute. July 2, 1942.
- M2** The significance of the lactic acid content of surviving and HS-treated corneas. (Report No. 16.) Heinz Herrmann. Wilmer Institute. July 22, 1942.
- M3** [The effect of mustard gas under various conditions on the permeability of the cornea, conjunctiva and sclera.] (Report No. 1.) D. G. Cogan, V. Everett Kinsey and W. Morton Grant. OEMcmr-141. [Harvard University, Medical School.] July 29, 1942.
- M4** Inhibition of corneal swelling ability by DH in organic solvents. (Report No. 5.) D. G. Cogan, V. Everett Kinsey and W. Morton Grant. OEMcmr-141. Harvard University, Medical School. October 1, 1942.
- M5** [Effects of HS on the cornea.] Conclusions [of the] Committee on the Treatment of Gas Casualties. (Report No. 6.) D. G. Cogan, V. Everett Kinsey and W. Morton Grant. OEMcmr-141. [Harvard University, Medical School.] December 8, 1942.
- M6** Correlation of rate of reaction of HS and HS intermediates within corneal tissue (in vitro) with the effect produced. (Report No. 8.) V. Everett Kinsey and W. Morton Grant. OEMcmr-141. Harvard University, Medical School. December 24, 1942.
- M7** The persistence of HS in corneal tissue. (Report

- No. 29.) Albert C. Snell, Jr. OEMcmr-24. Wilmer Institute. January 22, 1943.
- M8** Further studies on the effect on the metabolism of the cornea resulting from exposure to HS vapor. (Report No. 32.) Heinz Herrmann and Fay H. Hickman. OEMcmr-24. Wilmer Institute. March 27, 1943.
- M9** The loosening of the corneal epithelium by mustard and other agents. (Report No. 33.) Heinz Herrmann and Fay H. Hickman. OEMcmr-24. Wilmer Institute. March 30, 1943.
- M10** The loosening of the corneal epithelium by mustard. [Part] II, Effect of temperature. (Report No. 39.) Heinz Herrmann and Fay H. Hickman. OEMcmr-24. Wilmer Institute. September 10, 1943.
- M11** The effect of H on the utilization of ribose and other pentoses by the beef cornea. (Report No. 41.) Heinz Herrmann and Fay H. Hickman. OEMcmr-24. Wilmer Institute. [October (?) 1943.]
- M12** The loosening of the corneal epithelium. [Part] III, Further studies and an analysis of previously reported findings. (Report No. 45.) Heinz Herrmann and Fay H. Hickman. OEMcmr-24. Wilmer Institute. November 30, 1943.
- M13** Pyruvate metabolism in beef cornea, normally and after exposure to H. (Report No. 50.) Heinz Herrmann and Fay H. Hickman. OEMcmr-24. Wilmer Institute. April 15, 1944.
- M14** Summary of current studies on the effect of H on corneal metabolism. (Report No. 51.) Heinz Herrmann, Fay H. Hickman and Sylvia G. Moses. OEMcmr-24. Wilmer Institute. April 16, 1944.
- M15** The water content of the corneal epithelium after treatment with H and with other agents which loosen the epithelium. (Report No. 55.) Heinz Herrmann. OEMcmr-24. Wilmer Institute. June 17, 1944.
- M16** The effect of H on the non-protein nitrogen of the cornea. (Report No. 56.) Heinz Herrmann and Sylvia G. Moses. OEMcmr-24. Wilmer Institute. July 8, 1944.
- M17** The utilization of ammonia by the cornea after exposure to H. (Report No. 57.) Heinz Herrmann and Sylvia G. Moses. OEMcmr-24. Wilmer Institute. July 10, 1944.
- M18** The effect of H on the alkaline glycono-phosphatase of the corneal epithelium. (Report No. 61.) Jonas S. Friedenwald and Wilhelm Buschke. OEMcmr-24. Wilmer Institute. August 19, 1944.
- M19** The healing of wounds in the corneal epithelium after exposure to H. (Report No. 62.) Jonas S. Friedenwald and Wilhelm Buschke. OEMcmr-24. Wilmer Institute. August 22, 1944.
- M20** Possible products of the utilization of pyruvate in the beef cornea and the effect of H on the utilization of acetoin and butyrate by this tissue. (Report No. 64.) Heinz Herrmann and Fay H. Hickman. OEMcmr-24. Wilmer Institute. February 20, 1945.

- M21** Experiments on the increased NPN level in the excised corneas after exposure to H. (Report No. 66.) Heinz Herrmann and Sylvia G. Moses. OEMcmr-24. Wilmer Institute. March 12, 1945.
- M22** The effect of anaerobiosis upon the development of certain pathologic changes in the excised surviving cornea after application of H and various other substances. (Report No. 68.) Heinz Herrmann and Sylvia G. Moses. OEMcmr-24. Wilmer Institute. July 14, 1945.
- M23** The effect of mustard treatment on the histological staining characteristics of corneal tissue. (Report No. 69.) Jonas S. Friedenwald and Roy O. Scholz. OEMcmr-24. Wilmer Institute. August 1, 1945.

312.132 Skin of the Rat

- M1** Studies of the effects of HS on the skin of the rat. [Part] III, Observations on the pattern of cutaneous injury in normal rats and the determination of the most suitable sites for testing. Maurice Sullivan. OEMcmr-82. [Johns Hopkins University.] July 3, 1942.
- M2** Studies of the effects of HS on the skin of the rat. [Part] V, A comparison of the effect of HS on the skin of normal rats and rats deficient in the entire Vitamin B complex other than thiamin. Maurice Sullivan. OEMcmr-82. [Johns Hopkins University.] July 24, 1942.
- M3** Studies of the effects of HS on the skin of the rat. [Part] VI, The reactivation phenomenon. Maurice Sullivan. OEMcmr-82. [Johns Hopkins University.] September 1, 1942.
- M4** Studies of the effects of H on the skin of rats. [Part] VIII, Note on the production of a uniform injury with varying small amounts of H applied with a 6.25-mm steel rod. (Report No. 9.) Maurice Sullivan. OEMcmr-82. [Johns Hopkins University.] January 9, 1943.
- M5** Studies of the effects of H on the skin of the rat. [Part] IX, A comparison of the injury in fat-deficient and normal rats. (Report No. 10.) Maurice Sullivan. OEMcmr-82. [Johns Hopkins University.] January 15, 1943.
- M6** Studies of the effects of H on the skin of the rat. [Part] X, Carbohydrate deficiency. (Report No. 11.) Maurice Sullivan. OEMcmr-82. [Johns Hopkins University.] January 21, 1943.
- M7** Studies on the effects of H on the skin of the rat. [Part] XI, Protein deficiency. (Report No. 12.) Maurice Sullivan. OEMcmr-82. [Johns Hopkins University.] January 26, 1943.
- M8** Studies of the effects of HS on the skin of the rat. [Part] XIII, A comparison of the microscopic alterations produced by the application of small amounts of HS and M-1. (Report No. 14.) Maurice Sullivan. OEMcmr-82. [Johns Hopkins University.] March 6, 1943.
- M9** Studies of the effects of HS on the skin of the rat. [Part] XIV, Pyridoxine deficiency. (Report No. 15.)

Maurice Sullivan. OEMcmr-82. [Johns Hopkins University.] March 17, 1943.

- M10** Studies of the effects of HS on the skin of the rat. [Part] XV, Riboflavin deficiency. (Report No. 16.) Maurice Sullivan. OEMcmr-82. [Johns Hopkins University.] March 17, 1943.
- M11** Studies of the effects of HS on the skin of the rat. [Part] XVI, The effect of feeding para amino benzamide. (Report No. 17.) Maurice Sullivan. OEMcmr-82. [Johns Hopkins University.] April 13, 1943.
- M12** Studies of the effect of HS on the skin of the rat. [Part] XVII, Pantothenic acid deficiency. (Report No. 18.) Maurice Sullivan. OEMcmr-82. [Johns Hopkins University.] May 3, 1943.
- M13** Studies of the effects of HS on the skin of the rat. [Part] XVIII, Summary of the results of tests with various compounds. (Report No. 19.) Maurice Sullivan. OEMcmr-82. [Johns Hopkins University.] May 21, 1943.
- M14** Studies of the effects of HS on the skin of the rat. [Part] XIX, Vitamin A deficiency. (Report No. 20.) Maurice Sullivan. OEMcmr-82. [Johns Hopkins University.] July 23, 1943.
- M15** Studies of the effects of HS on the skin of the rat. [Part] XX, Analysis of the influence of choline and cystine. (Report No. 21.) Maurice Sullivan. OEMcmr-82. [Johns Hopkins University.] September 1, 1943.
- M16** Studies of the effects of HS on the skin of the rat. [Part] XXI, The effect of a low protein (casein) diet. (Report No. 22.) Maurice Sullivan. OEMcmr-82. [Johns Hopkins University.] September 1, 1943.
- M17** Studies of the effects of HS on the skin of the rat. [Part] XXII, Experiments with biotin-deficient animals and an evaluation of the effect of administering biotin concentrate to normal animals. (Report No. 23.) Maurice Sullivan. OEMcmr-82. [Johns Hopkins University.] September 1, 1943.
- M18** Studies of the effects of HS on the skin of the rat. [Part] XXIII, Magnesium deficiency. (Report No. 24.) Maurice Sullivan. OEMcmr-82. [Johns Hopkins University.] September 1, 1943.
- M19** Studies of the effects of HS on the skin of the rat. [Part] XXIV, Observations on the effect of inanition. (Report No. 25.) Maurice Sullivan. OEMcmr-82. [Johns Hopkins University.] September 1, 1943.
- M20** Studies of the effects of HS on the skin of the rat. [Part] XXVI, The spreading effect produced by flexion and extension of an extremity immediately after the application of the vesicant to the groin. (Report No. 27.) Maurice Sullivan. OEMcmr-82. [Johns Hopkins University.] September 1, 1943.

312.133 Skin of the Rabbit

- M1** Percent of free H recoverable from rabbit skin after various intervals. (Informal Progress Report

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No. 24.) A. D. Bass, T. H. Bullock and J. B. Fishman. OEMcmr-51. [Yale University.] May 2, 1943.

- M2** The rate of evaporation of H from liquid drops on rabbit skin. (Informal Progress Report No. 30.) T. H. Bullock and J. B. Fishman. OEMcmr-51. [Yale University.] May 17, 1943.

312.134 Skin of the Pig

- M1** The study of the mechanism of the physiological action of mustard by means of radioactive mustard. (Progress Report No. 207, to March 6, 1942.) George B. Kistiakowsky. NDCrc-169; Service Project No. CWS-2; OSRD No. 451. Harvard University. March 16, 1942.
- M2** A study of the fixed mustard in skin tissues. Richard A. Ormsbee, Frederick C. Henriques, Jr. and Eric G. Ball. OEMsr-86; Service Project No. CWS-2; OSRD No. 1825. Harvard University. September 21, 1943.
- M3** A study of sulfonium salts formed by the hydrolysis of radioactive mustard in water, in blood plasma and in pig skin in vivo. (Informal Monthly Progress Report.) Frederick C. Henriques, Jr., Alan R. Moritz and others. NDCrc-169. [Harvard University.] November 10, 1944.

312.135 Skin of the Guinea Pig

- M1** Induced hypersensitivity to bis(β -chloroethyl) sulphide (mustard gas) and to 2,3-dimercaptopropanol (BAL) in guinea pigs. (Progress Report [to] January 2, 1944.) John G. Kidd and Karl Landsteiner. OEMsr-62; Service Project No. CWS-2; OSRD No. 3269. Rockefeller Institute for Medical Research. March 4, 1944.

312.136 Skin of Man

- M1** Keratolytics, caustics and H burns. (Informal Progress Report No. 28.) A. D. Bass, T. H. Bullock and J. B. Fishman. OEMcmr-51. [Yale University.] May 16, 1943.
- M2** Comparison of lesions produced by 2.5 milligrams of mustard gas on human skin when applied by droplet from a 27-gauge needle and by spreading with a small disc (drod-tip). (Report No. B-3.) Marion B. Sulzberger, Rudolph L. Baer and others. OEMcmr-103. Cornell University, Medical College. August 27, 1943.
- M3** Skin tests with dilutions of mustard gas and the determination of levels of sensitivity in normal individuals and in those experimentally exposed to relatively small amounts of liquid mustard gas. (Report No. B-6.) Rudolf L. Baer and Marion B. Sulzberger. OEMcmr-103. Cornell University, Medical College. November 15, 1943.
- M4** Analysis of variations in size of blister after application of H. (Progress Report to June 19, 1944.) Sewall Wright. NDCrc-132; Service Project No. CWS-2; OSRD No. 3943. University of Chicago. July 27, 1944.

- M5** Tests for skin sensitivity to mustard gas [on] previously exposed subjects and non-exposed control subjects. (Report No. B-31.) Marion B. Sulzberger and Clare Lowenberg. OEMcmr-103. Cornell University, Medical College. November 2, 1944.

312.14 Systemic Effects

- M1** [RH investigations.] (Progress Report No. 7.) Richard A. Ormsbee, R. P. Linstead and others. [OEM]sr-86. Harvard University, Medical School. [June 23, 1942.]
- M2** [Some pharmacological effects of DHX.] (Informal Monthly Progress Report No. 8.) Sidney P. Colowick, Louis Berger and Milton W. Slein. [OEMsr-] 123. [Washington University.] August 19, 1942.
- M3** A study of some of the reaction characteristics of semi-H (β -chloro, β' -hydroxy diethyl sulfide) and their biological significance. (Report No. 9.) W. Morton Grant and V. Everett Kinsey. OEMcmr-141. Harvard University, Medical School. January 23, 1943.
- M4** Systemic effects of mustard and its bis-sulfonium salt with thiodiglycol, with special reference to leucocytes and hematopoietic system. (Informal Progress Report No. 29.) William T. Salter, T. H. Bullock and J. B. Fishman. OEMcmr-51. [Yale University.] June 16, 1943.
- M5** Review of the literature on the systemic action of mustard gas. (Progress Report to August 1, 1943.) Homer W. Smith. OEMsr-556; Service Project No. CWS-2; OSRD No. 1717. New York University. August 16, 1943.
- M6** A study of the composition of the blood and urine of rabbits and rats as affected by the administration of H. (Final Report to June, 1944.) Eric G. Ball, Elmer H. Stotz and others. OEMsr-86; Service Project No. CWS-2; OSRD No. 3923. Harvard University. July 21, 1944.
- M7** Measurement of rate of reaction of H in blood. (Report No. 45.) W. Morton Grant and V. Everett Kinsey. OEMcmr-141. Harvard University, Medical School. January 2, 1945.
- M8** Tissue metabolism, glycogen synthesis of the liver and intestinal absorption of glucose on H-treated rats. (Report No. 18.) E. S. Guzman Barron and Ulric A. Presta. OEMcmr-57. [University of Chicago.] July 2, 1945.

312.2 Sulfur Pentafluoride

- M1** Toxicity, pathological and charcoal-penetration studies of sulfur pentafluoride. (Progress Report to November 22, 1943.) Julius M. Coon, Morris A. Lipton and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 3030. University of Chicago. December 30, 1943.

312.3 Sulfones

- M1** bis(2-Chloroethyl) sulfone. Toxicity upon inhalation and vesicant properties. (Progress Report No. 254, to May 12, 1942.) Morris A. Lipton, George

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J. Rotariu and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 593. University of Chicago. May 28, 1942.

M2 Some factors affecting the toxicity of divinyl sulfone for yeast and reversal of toxic effect by various means. (Report No. 24.) V. Everett Kinsey and W. Morton Grant. OEMcmr-141. Harvard University, Medical School. February 24, 1944.

M3 Reactions of divinyl sulfone considered in relation to reversal of its effect on the cell. (Report No. 25.) W. Morton Grant and V. Everett Kinsey. OEMcmr-141. Harvard University, Medical School. March 6, 1944.

M4 Reaction of divinyl sulfone with glutathione in yeast and relation between effect and diminution of glutathione. (Report No. 26.) V. Everett Kinsey and W. Morton Grant. OEMcmr-141. Harvard University, Medical School. March 7, 1944.

M5 Determination of the effect of detoxifying treatment on the persistence of divinyl sulfone in yeast cells. (Report No. 41.) W. Morton Grant, V. Everett Kinsey and others. OEMcmr-141. Harvard University, Medical School. October 30, 1944.

M6 Further studies on the mechanism of poisoning of yeast by divinyl sulfone. (Report No. 53.) V. Everett Kinsey and W. Morton Grant. OEMcmr-141. Harvard University, Medical School. August 9, 1945.

313 Arsenic (See also: 213)

313.1 Arsine Toxicity

M1 Arsine. [Part] 1, Median lethal concentration for white mice. [Part] 2, Effect of high concentrations for short exposures. (Progress Report No. 297, to June 4, 1942.) Julius M. Coon, Howard G. Glass and Clarence C. Lushbaugh. NDCrc-132; Service Project No. CWS-2; OSRD No. 733. University of Chicago. July 20, 1942.

M2 Toxic effects of various arsine derivatives. [Part] I, A survey of factors influencing toxicity determinations and a summary of preliminary results with compounds of the type $RAsCl_2$ and R_1R_2AsCl . (Progress Report No. 324, to August 6, 1942.) John O. Hutchens, Arthur F. Abt and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 823. University of Chicago. August 24, 1942.

M3 Toxic effects of various arsine derivatives. [Part] II, A comparison of the lethal effects of several dichloroarsines on mice exposed to the vapors at low relative humidity. (Progress Report to January 18, 1943.) John O. Hutchens, Clarence C. Lushbaugh and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 1199. University of Chicago. February 16, 1943.

M4 Toxic effects of various arsine derivatives. [Part] III, Lethal effects produced by absorption of vapor

of dichloro(2-chlorovinyl)arsine and dichloroethylarsine through the skin of dogs, cats, rats, rabbits, guinea pigs and mice. (Progress Report to February 12, 1943.) John O. Hutchens, Clarence C. Lushbaugh and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 1253. University of Chicago. March 11, 1943.

M5 Toxic effects of various arsine derivatives. [Part] IV, Toxic effects of certain nitrophenyldichloroarsines. (Progress Report to March 10, 1943.) Simon Black, Raymond G. Murray and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 1328. University of Chicago. April 7, 1943.

313.2 Furylarsine Toxicity

M1 A toxicity study of several furan derivatives. (Progress Report to January 18, 1943.) George J. Rotariu, Morris A. Lipton and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 1200. University of Chicago. February 16, 1943.

314 Cobalt (Salcomine)

M1 Toxicity tests on salcomine oxygen and on salcomine powder. (Progress Report No. 369 [to] September 10, 1942.) Julius M. Coon, Howard G. Glass and Clarence C. Lushbaugh. NDCrc-132; Service Project No. CWS-2; OSRD No. 892. University of Chicago. September 22, 1942.

315 Disulfur Decafluoride

M1 Studies on Z. (Report No. 14.) R. W. Gerard, J. Tobias and others. OEMcmr-114. University of Chicago. April 7, 1944.

316 Tin

M1 Toxicity and vesicant action of various organic tin compounds. (Progress Report No. 358, to August 27, 1942.) Howard G. Glass, Julius M. Coon and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 868. University of Chicago. September 7, 1942.

320 Nitrogen Compounds (See also: 220)

321 Amines

321.1 Nitrogen Mustards (HN-1, HN-2 and HN-3)

M1 The effects of di-(β -chloroethyl) methylamine hydrochloride on renal function in rabbits. (Progress Report No. 465.) Betty Crawford and E. P. Hiatt. OEMsr-556; Service Project No. CWS-2; OSRD No. 1107. New York University. December 9, 1942.

M2 Summary of the biochemical and pharmacological properties of the amine mustards. (Progress Report No. 466.) Homer W. Smith. OEMsr-556; Service Project No. CWS-2; OSRD No. 1131. New York University. December 9, 1942.

M3 Toxicity of water contaminated with bis(β -chloroethyl) methyl amine (TL-146) and tris(β -chloro-

- ethyl)amine (TL-145) and procedures for decontamination. Alfred Gilman, Louis S. Goodman and Frederick S. Philips. OEMcmr-51. [Yale University.] December 16, 1942.
- M4** The effect of TL-145, tris(β -chloroethyl)amine, and TL-146, bis(β -chloroethyl)methyl amine, on the metabolism of tissues and on the activity of some enzyme systems. E. S. Guzman Barron, Zelma Baker Miller and others. OEMcmr-57. [University of Chicago.] December 18, 1942.
- M5** The pathology of poisoning with dichlorodiethylmethylamine. (Progress Report to January 12, 1943.) Clarence C. Lushbaugh. NDCrc-132; Service Project No. CWS-2; OSRD No. 1173. University of Chicago. February 3, 1943.
- M6** The pharmacodynamics of the nitrogen mustards. Alfred Gilman, Louis S. Goodman and Frederick S. Philips. OEMcmr-51. [Yale University.] February 19, 1943.
- M7** Further studies on the toxicity of orally ingested TL-145 in water. The adequacy of the DB-3 test for detection of toxic concentrations of TL-145. Alfred Gilman, Louis S. Goodman and Frederick S. Philips. OEMcmr-51. [Yale University.] March 7, 1943.
- M8** The clinical pathology of di(β -chloroethyl)methylamine, TL-146. David A. Karnofsky, Irving Graef and Elesá Addis. OEMsr-556; Service Project No. CWS-2; OSRD No. 1339. New York University. March 22, 1943.
- M9** The toxicity of TL-145 in tap water. Minimum concentration causing toxic manifestations in rats. The use of the DB-3 test for determining potability for man. D. Wright Wilson, Samuel Gurin and others. OEMcmr-108. University of Pennsylvania. May 7, 1943.
- M10** Tissue metabolism and the activity of some enzyme systems in rats gassed with TL-146. E. S. Guzman Barron, Zelma Baker Miller and others. OEMcmr-57. [University of Chicago.] May 26, 1943.
- M11** The reactions of amine mustards with chemical constituents of biological systems. Joseph S. Fruton, Max Bergmann and others. OEMsr-313; Service Project No. CWS-2; OSRD No. 1855. Rockefeller Institute for Medical Research. September 28, 1943.
- M12** The bone marrow and hemopoietic effects in mice of small repeated parenteral doses of TL-145-HCl. Thomas Dougherty, Louis S. Goodman and others. OEMcmr-51. [Yale University.] October 5, 1943.
- M13** The pathology of a standard ocular lesion . . . [caused by] liquid HN-2. (Report No. 39.) Francis Heed Adler, Wilfred E. Fry and others. OEMcmr-9. [University of Pennsylvania.] January 22, 1944.
- M14** Studies on the cause of death after systemic intoxication with the β -chloroethyl vesicants. (Progress Report to March 1, 1944.) Homer W. Smith, Betty Crawford and C. Riley Houck. OEMsr-556; Service Project No. CWS-2; OSRD No. 3467. New York University. April 12, 1944.
- M15** Increased tolerance of rats subjected to repeated exposure to HN compounds. (Report No. A-13.) D. Wright Wilson, Harry M. Vars and others. OEMcmr-108. University of Pennsylvania. September 9, 1944.
- M16** Comparison of the toxicity of HN-2-amine and HN-2-imine, and toxicity of HN-3 to yeast. (Report No. 47.) V. Everett Kinsey and W. Morton Grant. OEMcmr-141. Harvard University, Medical School. March 16, 1945.
- M17** Studies on the mechanism of production of systemic injuries by di- β -chloroethylmethylamine hydrochloride. David A. Karnofsky, Irving Graef and Homer W. Smith. [OEMsr-556.] [New York University.] (n.d.)
- 321.2 Compounds 1070 and 1130**
- M1** The effect of [Compounds] 1070 and 1130 on the metabolism of tissue slices and some enzyme systems. E. S. Guzman Barron, Zelma Baker Miller and others. OEMcmr-57. University of Chicago. September 18, 1942.
- M2** The inhibiting action of [Compound] 1130 on choline esterase. (Report No. 21.) Heinz Herrmann and Fay H. Hickman. OEMcmr-24. Wilmer Institute. November 20, 1942.
- M3** The effect of [Compound] 1130 on the mitotic activity of the corneal epithelium. (Report No. 37.) Jonas S. Friedenwald and Roy O. Scholz. OEMcmr-24. Wilmer Institute. May 31, 1943.
- M4** Clinical and pathological studies on . . . ocular burns [caused by Compound 1130] in the rabbit. (Report No. 38.) Roy O. Scholz. OEMcmr-24. Wilmer Institute. August 26, 1943.
- 321.3 Diamines**
- M1** Paraphenylenediamine compounds. (Progress Report to February 10, 1944.) Lee Irvin Smith and Vaughn Engelhardt. OEMsr-372; Service Project No. CWS-4; OSRD No. 5247. University of Minnesota. June 25, 1945.
- 321.4 Hexanitrodiphenylamine**
- M1** Hypersensitivity and flare-up dermatitis caused by hexanitrodiphenylamine and enemy explosives containing it. (Progress Report to October 19, 1943.) John G. Kidd. OEMsr-62; Service Project No. NO-160; OSRD No. 3029. Rockefeller Institute for Medical Research. December 23, 1943.
- 322 Carbamates**
- M1** Review of carbamates tested for toxicity. Karl A. Folkers. June 15, 1944.
- M2** Survey of toxicities of some 300 aromatic carbamates. (Progress Report to March 31, 1945.) William H. Elder, Crawford F. Failey and B. E. Ginsburg. NDCrc-132; Service Project No. CWS-2;

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- OSRD No. 5195. University of Chicago. August 22, 1945.
- 322.1 Compound TL-186 (KB-16)**
- M1** Effect of KB-16 on tissue and cell metabolism and on the activity of enzyme systems. E. S. Guzman Barron, Zelma Baker Miller and others. OEMcmr-57. University of Chicago. [July, 1942.]
- M2** Corneal damage caused by TL-186. (Special Report No. 1.) Julius M. Coon, John M. Richardson and Lawrence S. Sonkin. University of Chicago. July 24, 1942.
- M3** The effect of TL-186 on goats, monkeys and dogs. (Special Report No. 8.) Julius M. Coon, John M. Richardson and Lawrence S. Sonkin. University of Chicago. September 23, 1942.
- M4** The carbamates. [Part] I, Toxicity of TL-186 in drinking water. [Part] II, Toxicity data for TL-154 for mice exposed on the Benesh machine. [Part] III, Eye effects. (Special Report No. 9.) Julius M. Coon, John M. Richardson and others. University of Chicago. October 31, 1942.
- M5** The pathology of TL-186 poisoning. (Special Report No. 12.) Clarence C. Lushbaugh, Julius M. Coon and Lawrence S. Sonkin. University of Chicago. November 18, 1942.
- M6** TL-186, N-(2-chloroethyl)-N-nitroso methyl carbamate. A comparison of the toxicity of the plant run product with that of the laboratory preparation. (Report No. 17.) George J. Rotariu and Clarence C. Lushbaugh. University of Chicago. December 14, 1942.
- M7** The effects of KB-16 vapor on the rabbit's eye. (Report No. 30.) William F. Hughes, Jr. OEMcmr-24. Wilmer Institute. February 3, 1943.
- M8** [Pathological effects of] N-nitroso-N-chloroethyl-carbamic acid methyl ester, TL-186. (Progress Report to March 1, 1943.) Irving Graef and David A. Karnofsky. OEMsr-556; Service Project No. CWS-2; OSRD No. 1272. New York University. March 17, 1943.
- M9** Pulmonary insufficiency in rabbits receiving N-nitroso-N-chloroethyl carbamic acid methyl ester (TL-186) intravenously. (Progress Report to March 1, 1943.) Betty Crawford and Homer W. Smith. OEMsr-556; Service Project No. CWS-2; OSRD No. 1286. New York University. March 23, 1943.
- 322.2 Compounds TL-154 and TL-316**
- M1** The carbamates. [Part] IV, LC₅₀ of TL-154 for mice. [Part] V, LC₅₀ of TL-316 for mice. (Special Report No. 13. Supplement to Special Report No. 9.) Julius M. Coon and George J. Rotariu. University of Chicago. November 23, 1942.
- 323 Cyanogens and Cyanates**
- 323.1 Cyanogen Chloride (CC and CK)**
- M1** CNCl poisoning. A preliminary note. E. S. Guzman Barron, Grant R. Bartlett and others. OEMcmr-57. [University of Chicago.] April 17, 1944.
- M2** Cyanogen chloride. Special toxicity studies. (Formal Report to March 31, 1945.) Julius M. Coon, George J. Rotariu and Drusilla Van Hoesen. NDCrc-132; Service Project No. CWS-2; OSRD No. 5001. University of Chicago. April 28, 1945.
- 323.2 Hydrocyanic Acid (AC)**
- M1** Hydrocyanic acid toxicity studies. (Progress Report to April 13, 1943.) Julius M. Coon, Howard G. Glass and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 1432. University of Chicago. May 18, 1943.
- 324 Azines**
- M1** Screening tests on several azine compounds. (Progress Report No. 321, to August 2, 1942.) George J. Rotariu and Morris A. Lipton. NDCrc-132; Service Project No. CWS-2; OSRD No. 810. University of Chicago. August 18, 1942.
- 325 Amides**
- M1** The toxicity, eye effects and pathological effects of N-(2-chloroethyl)-N-nitrosoacetamide. (Special Report No. 16.) George J. Rotariu, John M. Richardson and others. University of Chicago. December 11, 1942.
- 326 Comparison of Amines and Carbamates**
- M1** Corneal damage from TL-186 and TL-146. (Special Report No. 3. Supplement to Special Report No. 1.) John M. Richardson, Julius M. Coon and others. University of Chicago. August 18, 1942.
- M2** Present status of comparative effects of amines and carbamates on the eye. (Special Report Nos. 11 and 15.) John M. Richardson and Julius M. Coon. University of Chicago. November 10 and 23, 1942.
- 327 Miscellaneous Nitrogen Compound Toxicity Research**
- M1** Eye effects and toxicity of TL-329. Toxicity of [Compound] 1070 for mice. (Special Report No. 10.) Julius M. Coon, John M. Richardson and others. University of Chicago. October 31, 1942.
- 330 Carbon Compounds**
(See also: 230)
- 331 Carbon-Oxygen Compounds**
- 331.1 Phosgene and Diphosgene**
- M1** Diphosgene. Median lethal concentrations for mice for a ten-minute exposure. (Progress Report No. 298, to June 4, 1942.) Morris A. Lipton, George J. Rotariu and Clarence C. Lushbaugh. NDCrc-132; Service Project No. CWS-2; OSRD No. 734. University of Chicago. July 20, 1942.
- M2** The role of acid in diphosgene action. A note on ketene. (Final Report No. 7.) R. W. Gerard.

OEMcmr-114. [University of Chicago.] February 12, 1943.

M3 The physiological action of phosgene. T. H. Norris. University of California. October 22, 1943.

M4 Chemical reactions of diphosgene of biological significance. Its effect on enzyme systems and on the tissue metabolism of diphosgene-gassed rats. E. S. Guzman Barron, Grant R. Bartlett and others. OEMcmr-57. [University of Chicago.] December 20, 1943.

M5 Pulmonary [effects of phosgene]. (Progress Report No. 14.) John S. Lockwood. OEMcmr-13. [University of Pennsylvania.] February 1, 1944.

M6 Diphosgene and phosgene. (Interim Report No. 12 [covering the period from] March, 1943 through January, 1944.) R. W. Gerard, J. Tobias and others. OEMcmr-114. [University of Chicago.] February 26, 1944.

M7 The effects in rats and dogs of preliminary deprivation of water or food on survival of phosgene poisoning. The relation of the metabolic rate to mortality of phosgene poisoning. John S. Lockwood, H. D. Bruner and others. OEMcmr-13. University of Pennsylvania. May 11, 1944.

M8 [Circulatory studies of phosgene poisoning.] John S. Lockwood, H. D. Bruner and others. OEMcmr-13. University of Pennsylvania. June, 1944.

M9 Phosgene. Special studies. (Progress Report to January 2, 1945.) Julius M. Coon, George J. Rotariu and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 4637. University of Chicago. January 27, 1945.

331.2 Carbonyl Chlorofluoride

M1 Toxicity studies of carbonyl chlorofluoride. (Progress Report to August 26, 1943.) Julius M. Coon, Lawrence S. Sonkin and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 1806. University of Chicago. September 16, 1943.

331.3 Choline

M1 The toxicity of β -chlorethylthiocholine-chloride. (Progress Report No. 140.) Julius M. Coon and Jules H. Last. NDCrc-132; Service Project No. CWS-2; OSRD No. 276. University of Chicago. December 13, 1941.

340 Plant Products

(See also: 240)

341 Compound W

M1 Effects of toxic doses of [Compound] W on blood pressure, blood clotting, blood sugar and liver glycogen in rabbits and rats, and their relationship to certain symptoms of W poisoning. (Progress Report to March 21, 1945.) Carl F. Cori, Sidney P. Colowick and others. OEMsr-123; Service Project No. CWS-2; OSRD No. 5033. Washington University. May 3, 1945.

M2 The toxicity of various preparations of [Compound] W. A comparison of toxicities by injection and by inhalation. (Progress Report to March 31, 1945.) Morris A. Lipton, Lawrence S. Sonkin and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 5525. University of Chicago. August 31, 1945.

M3 The pathology of [Compound] W. (Progress Report to October 1, 1945.) Boris Krichesky, Val B. Jager and William P. Anslow, Jr. OEMsr-556; Service Project No. CWS-2; OSRD No. 6131. New York University. October 17, 1945.

M4 The bioassay of [Compound] W. (Progress Report to February 28, 1945.) Alsoph H. Corwin, M. Virginia Carper and others. OEMsr-681; Service Project No. CWS-4; OSRD No. 4949. Johns Hopkins University. November 8, 1945.

350

Fluorine Compounds

(See also: 252 and 315)

M1 The toxicity of compounds containing fluorine. (Progress Report to November 1, 1943.) Morris S. Kharasch and S. Weinhouse. OEMsr-394; Service Project No. CWS-4; OSRD No. 3285. University of Chicago. February 21, 1944.

M2 The toxicity of compounds containing fluorine. ([Part] II. Progress Report [covering the period from] November 1, 1943 to August 1, 1944.) Morris S. Kharasch and Elwood V. Jensen. OEMsr-394; Service Project Nos. CWS-4 and CWS-2; OSRD No. 4055. University of Chicago. August 22, 1944.

351

Methyl Fluoroacetate

M1 On the mechanism of fluoroacetate poisoning. Inhibition by fluoroacetate of fatty acid metabolism. E. S. Guzman Barron, George Kalnitsky and others. OEMcmr-57. University of Chicago. August 21, 1944.

M2 On the mechanism of methyl fluoroacetate intoxication. Studies on fluoroacetate inhibition of enzyme systems. (Bi-monthly Report No. 19.) E. S. Guzman Barron. [OEMcmr-57.] [University of Chicago.] October 4, 1944.

M3 Effects of methyl fluoroacetate on isolated tissues and enzyme systems. (Progress Report to March 20, 1945.) Carl F. Cori, Sidney P. Colowick and others. OEMsr-123; Service Project No. CWS-2; OSRD No. 4984. Washington University. June 2, 1945.

M4 Action of AF-1 and various substrates on the resting potential of frog nerve. Abraham M. Shanes. [OEMsr-556.] [New York University.] [July 10, 1945.]

360

Comparative Studies of Vesicants

M1 The effect of flow rate on the toxicities of H, Q, HN-1, HN-3 and L by inhalation, by total exposure and by body exposure. (Progress Report

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to March 31, 1945.) Harry G. Albaum, Dora Benedict and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 5000. University of Chicago. April 28, 1945.

- M2** A formal analysis of the action of liquid vesicants on bare skin. (Progress Report to March 31, 1945.) Herbert D. Landahl. NDCrc-132; Service Project No. CWS-2; OSRD No. 5032. University of Chicago. May 5, 1945.

- M3** Tests for vesicancy on human skin. (Progress Report to January 1, 1945.) John F. Thomson, Hoylande D. Young and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 5194. University of Chicago. June 1, 1945.

361 Sulfur and Nitrogen Mustards

- M1** The clinical and pathologic effects of the vesicant nitrogen and sulfur mustards. Irving Graef, David A. Karnofsky and others. [OEMsr-556,] [New York University,] (n.d.)

361.1 Effects on Human Skin

- M1** A vapor-train study of the comparative vesicancy of mustard and several related amines and sulfides on human skin. (Progress Report to July 6, 1944.) Simon Black, Kenneth P. DuBois and Morris A. Lipton. NDCrc-132; Service Project No. CWS-2; OSRD No. 3944. University of Chicago. August 30, 1944.

- M2** The penetration of vesicant vapors into human skin. (Final Report to February 1, 1945.) Max Bergmann, Joseph S. Fruton and others. OEMsr-313; Service Project No. CWS-2; OSRD No. 4855. Rockefeller Institute for Medical Research. March 24, 1945.

- M3** The necrotizing action of certain substances related to mustard gas, H, or to the nitrogen mustards. A comparison of the vesicant action exerted on human skin by mustard gas, H, and by mixtures of H with wetting agents or solvents. (Progress Report to March 1, 1945.) George H. Hogeboom, Philip D. McMaster and others. OEMsr-434; Service Project No. CWS-2; OSRD No. 4852. Rockefeller Institute for Medical Research. March 25, 1945.

- M4** Observations on the role of water in the susceptibility of human skin to vesicant vapors. (Report to April 12, 1945.) Birdsey Renshaw. Service Project No. CWS-2; OSRD No. 5169. June 1, 1945.

- M5** The penetration of vesicant vapors into human skin. (Progress Report to May 15, 1945. Supplement to OSRD Report No. 4855.) Max Bergmann, Joseph S. Fruton and others. OEMsr-313; Service Project No. CWS-2; OSRD No. 5181. Rockefeller Institute for Medical Research. June 6, 1945.

361.2 Effects on the Eye

- M1** A comparison of the histopathology of the ocular lesions produced by mustard and nitrogen mus-

tards. (Report No. 49.) A. E. Maumenee. OEMcmr-24. Wilmer Institute. April 14, 1944.

- M2** Nuclear fragmentation produced by mustard and N mustard in the corneal epithelium. (Report No. 67.) Jonas S. Friedenwald and Wilhelm Buschke. OEMcmr-24. Wilmer Institute. July 10, 1945.

361.3 Systemic Effects

- M1** The reactions of DH, TL-146, TL-329 and TL-145 with some chemical constituents of biological systems. (Progress Report [to] May 1, 1943.) Max Bergmann, William H. Stein and others. OEMsr-313; Service Project No. CWS-2; OSRD No. 1438. Rockefeller Institute for Medical Research. May 21, 1943.

- M2** The comparative systemic effects of mustard and the nitrogen mustards HN-1, HN-2 [and] HN-3 in rats. (Progress Report to May 1, 1945.) Irving Graef, Val B. Jager and David A. Karnofsky. OEMsr-556; Service Project No. CWS-2; OSRD No. 5180. New York University and US Army, Chemical Warfare Service, Medical Division. June 6, 1945.

- M3** Effects of bis(β -chloroethyl)sulfide (H) and bis-(β -chloroethyl)methylamine (HN-2) on enzymes in vitro and in vivo. (Progress Report to February 28, 1945.) Carl F. Cori, Sidney P. Colowick and others. OEMsr-123; Service Project No. CWS-2; OSRD No. 5245. Washington University. June 20, 1945.

361.4 Effects on Structure and Function of Animal Cells

- M1** The effects of vesicants on cell division in *Arbacia punctulata*. (Progress Report to April 1, 1946.) R. Keith Cannan and Milton Levy. OEMsr-1050; Service Project No. CWS-2; OSRD No. 6664. New York University, College of Medicine. June 1, 1946.

- M2** The swelling of cells and its inhibition by vesicants. (Final Report to April 20, 1946.) Angelo E. Benaglia, R. Keith Cannan and others. OEMsr-1050; Service Project No. CWS-2; OSRD No. 6665. New York University, College of Medicine. June 1, 1946.

362 Mustard Gas and Lewisite

- M1** Studies with vesicant agents [HS and M-1]. I. A. Mirsky. April 20, 1942.

- M2** Determination of the distribution of H and L in skin and eye tissues by radio-autographic techniques. (Progress Report [to] July 30, 1943.) Joseph G. Hamilton and Dorothy Axelrod. OEMsr-456; Service Project No. CWS-2; OSRD No. 1911. University of California. October 13, 1943.

- M3** Tests on the sensitivity of whites and Nisei to mustard gas and lewisite, including tests for allergic sensitization to mustard gas following ex-

perimental exposure. (Report No. B-26.) Marion B. Sulzberger, Rudolf L. Baer and Abram Kanof. OEMcmr-103. Cornell University, Medical College. June 20, 1944.

- M4** Changes in the circulation and in the permeability of vessels within and about mustard gas and lewisite lesions of rabbit skin. (Progress Report to April, 1945.) Philip D. McMaster and George H. Hogeboom. OEMsr-434; Service Project No. CWS-2; OSRD No. 5026. Rockefeller Institute for Medical Research. May 3, 1945.

370 Methods and Equipment used in Toxicity Studies

- M1** Techniques employed in toxicity determinations at the University of Chicago Toxicity Laboratory. (Progress Report No. 370, to August 24, 1942.) Eugene M. K. Geiling and Franklin C. McLean. NDCrc-132; Service Project No. CWS-2; OSRD No. 893. University of Chicago. September 22, 1942.

371 Vesicant Appliers

- M1** [Methods for measuring and applying liquid lewisite and liquid mustard to the skin.] (Report No. I.) (n.a.) March 1, 1942.
- M2** A method for delivering equal amounts of fluids of differing physical properties. (Progress Report No. 287, to July 1, 1942.) Philip D. McMaster. OEMsr-434; Service Project No. CWS-2; OSRD No. 683. Rockefeller Institute for Medical Research. July 10, 1942.
- M3** A modification of the drod. (Progress Report to September 14, 1943.) William Bloom, Raymond G. Murray and others. OEMcmr-152 and NDCrc-132; Service Project No. CWS-2; OSRD No. 1899. University of Chicago. October 7, 1943.
- M4** The Benesh micropipette, with illustrative vesicant data. (Progress Report to September 15, 1944.) William Bloom, John F. Thomson and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 4230. University of Chicago. October 9, 1944.

372 Exposure Chambers and Exposure Methods

- M1** [The construction of a six-room respiration laboratory.] [Julius M. Coon.] [NDCrc-132.] University of Chicago. August 26, 1941.
- M2** Constant-flow micro-apparatus for exposure of mice to volatile toxic agents under controlled conditions. (Progress Report No. 248, to May 12, 1942.) John O. Hutchens. NDCrc-132; Service Project No. CWS-2; OSRD No. 580. University of Chicago. May 20, 1942.
- M3** A new apparatus for exposure of small animals to volatile toxic agents, [the] Benesh machine. (Progress Report No. 357, to August 26, 1942.) Morris A. Lipton and George J. Rotariu. NDCrc-132; Service Project No. CWS-4; OSRD No. 854. University of Chicago. September 7, 1942.
- M4** Improved micro-apparatus for controlled toxicity

determinations. (Progress Report to October 4, 1943.) John O. Hutchens, Matthew E. Benesh, Jr. and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 2047. University of Chicago. November 23, 1943.

- M5** A new chamber for the determination of toxicities by total, body or head exposure. (Progress Report to December 12, 1944.) John O. Hutchens, Haight W. Gurney and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 4585. University of Chicago. January 17, 1945.

380 Miscellaneous Physiological and Toxicity Studies

381 Aquatic Life

- M1** The effect of certain chemical warfare agents in water on aquatic organisms. (Final Report to January, 1944.) Arthur M. Buswell, Charles C. Price and others. OEMsr-593; Service Project No. CWS-6; OSRD No. 3589. University of Illinois. May 3, 1944.
- M2** Further data on the toxicity of various chemical warfare agents to fish. (Progress Report to February 28, 1945.) Charles C. Price and Bruno von Limbach. OEMsr-593; Service Project No. CWS-6; OSRD No. 5528. University of Illinois. August 28, 1945.

382 Yeast Cells

- M1** A comparison of the effects produced in yeast cells by different toxic agents with reference to their mode of action and lability of reaction products formed. (Report No. 22.) V. Everett Kinsey and W. Morton Grant. OEMcmr-141. Harvard University, Medical School. January 7, 1944.

383 Skin

- M1** Electrometric studies of skin burns. H. S. Burr. Yale University, School of Medicine. March 7, 1942.

384 Eyes

- M1** The injury to the rabbit's cornea by intracorneal injection of various chemical agents. (n.a.) [Wilmer Institute.] March 13, 1942.
- M2** [Reactions of ocular tissues to injurious agents.] Report to the Committee on Gas Casualties. Jonas S. Friedenwald. [Wilmer Institute.] March 18, 1942.
- M3** Inhibition of mitosis in the corneal epithelium. Comparison of the effects of mustard, nitrogen mustards, L, KB-16 and certain derivatives of [Compound] 1130. (Report No. 46.) Jonas S. Friedenwald and Roy O. Scholz. OEMcmr-24. Wilmer Institute. December 15, 1943.
- M4** The effect of various agents on the adherence of the corneal epithelium. (Report No. 54.) Heinz Herrmann. OEMcmr-24. Wilmer Institute. June 10, 1944.

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- 385 **Blood**
M1 A study of the hematological changes following exposure to certain war gases. (Progress Report to February 24, 1943.) Clarence C. Lushbaugh. NDCrc-132; Service Project No. CWS-2; OSRD No. 1313. University of Chicago. April 3, 1943.
- 386 **Lung Tissue**
M1 The metabolism of lung tissue as determined by a study of slices and ground tissue. E. S. Guzman Barron, Zelma Baker Miller and Grant R. Bartlett. OEMcmr-57. [University of Chicago.] March 8, 1943.
- 386.1 **Oil Clouds**
M1 Toxicity and incidence of lipid pneumonia upon inhalation of automobile oil (SAE No. 10) cloud. (Report No. 320, to August 12, 1942.) Clarence C. Lushbaugh and Paul R. Cannon. OSRD No. 809. University of Chicago. August 18, 1942.
M2 The intrapulmonic accumulation and effects of inhaled lubricating oil and SGF No. 1 oil in monkeys. (Progress Report to January 8, 1945.) Clarence C. Lushbaugh, C. Ernst Redemann and Joseph Savit. NDCrc-132; Service Project No. CWS-2; OSRD No. 4639. University of Chicago. January 27, 1945.
- 386.2 **Flame Throwers**
M1 An experimental investigation of the physiological mechanisms concerned in the production of casualties by flame thrower attack. (Progress Report to August, 1944.) Frederick C. Henriques, Jr., Alan R. Moritz and others. NDCrc-169; Service Project No. CWS-2; OSRD No. 4029. Harvard University. August 15, 1944.
M2 Symposium on the toxicological aspects of the flame thrower [at] Dumbarton Oaks, January 29, 1945. (n.a.) [January, 1945.]
M3 An experimental investigation of the physiological mechanisms concerned in the production of casualties by flame thrower attack. (Final Report to October 1, 1945.) Alan R. Moritz and Frederick C. Henriques, Jr. NDCrc-169; Service Project No. CWS-2; OSRD No. 6182. Harvard University. October 23, 1945.
- 387 **Miscellany**
M1 [Effects of HN-2 and of Compound W.] (Informal Monthly Progress Report No. 27.) Carl F. Cori, Sidney P. Colowick and others. OEMsr-123. [Washington University.] April 10, 1944.
M2 [Cytological effects of various toxic agents.] (Informal monthly progress reports.) R. Keith Canan, Milton Levy and others. OEMsr-1050. [New York University.] [May] 10 and July 10, 1944.
M3 Studies on AF-1, PF-3 and BAL. (Progress Report Nos. 13 and 15.) McKeen Cattell. OEMcmr-245. Cornell University, Medical College. May 31 and September 30, 1944.
- 400 **DETECTION AND IDENTIFICATION OF CHEMICAL WARFARE AGENTS**
M1 A system for the ultimate analysis of chemical warfare agents. (Appendices to Parts I-III. Progress Report to May 4, 1945.) E. H. Swift and Carl Niemann. OEMsr-325; Service Project No. CWS-6; OSRD No. 5075. California Institute of Technology. May 17, 1945.
M2 The collection and separation of samples of persistent agents from contaminated materials other than air. (Progress Report to December 30, 1943.) David H. Brown and Edward L. Bennett. OEMsr-325; Service Project No. CWS-6; OSRD No. 6119. California Institute of Technology. October 16, 1945.
- 410 **Detection Methods, Devices and Substances**
(See also: 420)
- 411 **Reagents**
- 411.1 **Paints, Powders and Papers**
M1 A preliminary study of detector paints and powders. (Technical Report No. 2.) Warren C. Johnson. University of Chicago. March 14, 1941.
M2 Detector powder No. 1 (brown). (Technical Report No. 20.) Warren C. Johnson. University of Chicago. September 24, 1941.
M3 Paints, powders and papers for the detection of persistent chemical warfare agents. (Final Report No. 103, to October 14, 1941.) Warren C. Johnson. NDCrc-39; Service Project No. CWS-6; OSRD No. 165. University of Chicago. November 4, 1941.
M4 Development of test paper, paint and powder for the persistent agents. (Progress Report No. 115, to September 30, 1941.) W. C. Fernelius and J. P. McReynolds. NDCrc-72; Service Project Nos. CWS-6 and NL-B32; OSRD No. 177. Ohio State University. November 14, 1941.
M5 Development of test paper, paint and powder for persistent agents and test papers for their oxidation products. (Final Report No. 181, to January 30, 1942.) W. C. Fernelius and J. P. McReynolds. NDCrc-72; Service Project Nos. CWS-6 and NL-B32; OSRD No. 511. Ohio State University. April 17, 1942.
M6 An investigation of dyestuffs as sensitive agents for detector paint. (Progress Report No. 300, to June 3, 1942.) John H. Yoe. OEMsr-139; Service Project No. CWS-6; OSRD No. 757. University of Virginia. July 22, 1942.
M7 Detector paints and papers. (Informal Monthly Progress Report covering the period [from] May 10 to June 10, 1943.) John H. Yoe and Everett

C. Cogbill. OEMsr-139. [University of Virginia.] June 10, 1943.

- M8** [Indicator papers for chemical warfare agents.] (Monthly Progress Report [covering the period from] January 11 to February 10, 1945.) Weldon G. Brown, Donald E. Pearson and others. OEMsr-79. University of Chicago. February 13, 1945.

411.2 Reagent DB-3

- M1** The preparation of the DB-3 reagent. (Progress Report No. 213, to March 17, 1942.) Weldon G. Brown. OEMsr-79; Service Project Nos. CWS-6 and NL-B32; OSRD No. 505. University of Chicago. April 15, 1942.
- M2** The preparation of the DB-3 reagent. (Progress Report No. 214, to March 2, 1942.) Homer Adkins. OEMsr-78; Service Project Nos. CWS-6 and NL-B32; OSRD No. 506. University of Wisconsin. April 15, 1942.
- M3** A catalyzed low-temperature development of the DB-3 test. (Informal Report No. 53.) Robert S. Livingston and Leonard F. Swec. OEMsr-79; Service Project No. CWS-6. [University of Chicago.] November 25, 1942.
- M4** The DB-3 reagent in tablet form for water testing. (Informal Report No. 68.) Weldon G. Brown and William R. Remington. OEMsr-79; Service Project No. CWS-6. [University of Chicago.] April 6, 1943.

411.3 Silica Gels

- M1** Equipment for the removal of iron from silica gel. (Informal Report No. 81.) Robert S. Livingston and Clyde Dillard. OEMsr-87; Service Project No. CWS-6. University of Chicago. July 26, 1943.
- M2** Estimation and control of the acidity of silica gels. (Informal Report No. 91.) David J. Lehmicke. OEMsr-1092. University of Minnesota. January 11, 1944.
- M3** Stability of CG gels. (Informal Report No. 92.) F. H. MacDougall and Margaret Seiz. OEMsr-1092. University of Minnesota. March 25, 1944.

411.4 Miscellaneous Reagents

- M1** An investigation of organic compounds as indicators for the vesicant agents. (Progress Report No. 463, to November 28, 1942.) John H. Yoe. OEMsr-139; Service Project No. CWS-6; OSRD No. 1116. University of Virginia. December 9, 1942.
- M2** Tetramethyldiaminothiobenzophenone color tests with chemical warfare agents. (Informal Report No. 80.) Weldon G. Brown and R. G. Denkwalter. OEMsr-79; Service Project No. CWS-6. University of Chicago. July 15, 1943.
- M3** Additional observations on the synthesis of thio-carbazones, especially DPT. (Progress Report to November 22, 1944.) D. S. Tarbell and E. G. Lindstrom. OEMsr-319; Service Project No. CWS-

6; OSRD No. 4411. University of Rochester. November 30, 1944.

- M4** Unsymmetrical diarylethylenes as detectors. (Progress Report to November 22, 1944.) D. S. Tarbell and E. G. Lindstrom. OEMsr-319; Service Project No. CWS-6; OSRD No. 4412. University of Rochester. November 30, 1944.
- M5** Thioketones as detectors for chemical warfare agents. (Progress Report to November 22, 1944.) D. S. Tarbell and V. P. Wystrach. OEMsr-319; Service Project No. CWS-6; OSRD No. 4413. University of Rochester. November 30, 1944.
- M6** Equilibria in aqueous chloramine-T solutions. (Progress Report to January 23, 1945.) Charles C. Price, T. E. Phipps and Marvin Den Harder. OEMsr-593; Service Project No. CWS-6; OSRD No. 4676. University of Illinois. January 31, 1945.

412

Field Kits

- M1** The vapor detector kit. (Informal Report No. 57.) Robert S. Livingston. OEMsr-79 and OEMsr-87; Service Project No. CWS-6. [University of Chicago.] [January 26, 1943.]
- M2** Vapor detection and identification equipment designed for use by the Office of Civilian Defense. (Informal Report No. 73.) Robert S. Livingston. OEMsr-79; Service Project No. CWS-6. [University of Chicago.] May 7, 1943.
- M3** The sensitivities of the tests of the vapor detector kit, E5-R3, to lethal and casualty-producing concentrations of common toxics. (Informal Report No. 76.) Robert S. Livingston. OEMsr-79 and OEMsr-87; Service Project No. CWS-6. University of Chicago. May 27, 1943.
- M4** Field kit . . . for the detection of chemical warfare agents in water. (Final Report to August 20, 1943.) Arthur M. Buswell. OEMsr-593; Service Project No. CWS-14; OSRD No. 1732. University of Illinois. August 30, 1943.
- M5** Report of conference at [the] Naval Research Laboratory concerning NRL detector kit. (n.a.) [July, 1944.]

412.1

Detector Tubes

- M1** Recommendations for the detector tubes to be used in the field kit. (Informal Report Nos. 51 and 51a.) Robert S. Livingston, Weldon G. Brown and Warren C. Johnson. OEMsr-87 and OEMsr-79; Service Project No. CWS-6. University of Chicago. November 17 and 30, 1942.
- M2** The effect of temperature and humidity on the sensitivities of the several tubes of the vapor detector kit, E4-R10. (Informal Report No. 67.) Robert S. Livingston. OEMsr-79 and OEMsr-87; Service Project No. CWS-6. [University of Chicago.] April 1, 1943.
- M3** The heating of detector tubes and the temperatures attained under various conditions. (Informal

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Report No. 96.) F. H. MacDougall and David J. Lehmicke. OEMsr-1092. University of Minnesota. May 12, 1944.

412.2 Foreign Types

- M1** Review of American, British, German, Japanese and Italian field detector kits. Morris B. Jacobs. [June, 1944.]
- M2** Tabular summary of British, Chinese, German, Japanese and Italian field detector kits. Morris B. Jacobs. April 17, 1945.

413 Automatic Instruments

413.1 Titrimeters

- M1** Amplifier to replace galvanometer in potentiometric titration of small amounts of M-1, HS, ED or DM. (Progress Report No. 183a, to April 13, 1942. Supplement to OSRD Report No. 401.) John H. Northrop. OEMsr-129; Service Project No. CWS-6; OSRD No. 570. Rockefeller Institute for Medical Research. May 15, 1942.
- M2** Automatic titrator for the determination of H, L and other gases in air. (Progress Report [to] November 15, 1943.) John H. Northrop. OEMsr-129; Service Project No. CWS-6; OSRD No. 3112. Rockefeller Institute for Medical Research. January 13, 1944.
- M3** Automatic potentiometric recording equipment for determination of chemical warfare agents. (Final Report to March 20, 1944.) George A. Perley and E. L. Eckfeldt. OEMsr-813; Service Project No. CWS-6; OSRD No. 3616. Leeds and Northrup Company, Inc. May 9, 1944.
- M4** An electronic interval timer for the Northrop titrimeter. (Progress Report to September 15, 1944.) C. Ernst Redemann. NDCrc-132; Service Project No. CWS-2; OSRD No. 4218. University of Chicago. October 6, 1944.

413.11 Pumps

- M1** Electromagnetic gas pump. (Progress Report to November 20, 1944.) John H. Northrop. OEMsr-129; Service Project No. CWS-6; OSRD No. 4538. Rockefeller Institute for Medical Research. January 2, 1945.
- M2** A semi-variable air pump. (Progress Report to August 1, 1945.) Anthony Briglio, Jr., John A. Brockman, Jr. and others. OEMsr-325; Service Project No. CWS-6; OSRD No. 6047. California Institute of Technology. September 5, 1945.

413.2 Tape Recorders

- M1** Operation of tape recorders for CG during Florida trials. (Informal Report No. 94.) Robert J. Stell and Kenneth E. Wilzbach. OEMsr-79. [University of Chicago.] March 1, 1944.
- M2** Paper tape recording of chemical warfare agents. (Informal Report No. 95.) Donald E. Pearson,

William R. Remington and others. OEMsr-79. University of Chicago. March 30, 1944.

- M3** Tape recorder operations at the Field Experimental Station, Suffield, Alberta, Canada. (Progress Report to September, 1945.) Weldon G. Brown. OEMsr-79; Service Project No. CWS-6; OSRD No. 6060. University of Chicago. October 6, 1945.

413.3 Miscellaneous Instruments

- M1** Photoelectric cell for recording the presence of HS or other gases in air. (Progress Report No. 367, to September 10, 1942.) John H. Northrop. OEMsr-129; Service Project No. CWS-6; OSRD No. 880. Rockefeller Institute for Medical Research. September 19, 1942.
- M2** Automatic detection of gases which react with silver ions by means of silver electrodes. (Informal Progress Report [to] March 15, 1944.) John H. Northrop. OEMsr-129; Service Project No. CWS-6; OSRD No. 3436. Rockefeller Institute for Medical Research. April 4, 1944.
- M3** A recording field sight. (Progress Report to August 1, 1945.) Anthony Briglio, Jr., John A. Brockman, Jr. and others. OEMsr-325; Service Project No. CWS-6; OSRD No. 6045. California Institute of Technology. September 5, 1945.
- M4** A study of turbulent diffusion of gas clouds over several terrains. (Progress Report to October 1, 1945.) Harold S. Johnston, Robert S. Merrill and Robert L. Mills. OEMsr-325; Service Project No. CWS-6; OSRD No. 6185. California Institute of Technology. January 28, 1946.

414 Laboratory Methods

- M1** Recommendations for a field theatre of operations chemical laboratory. (Informal Report No. 59.) Carl Niemann and E. H. Swift. OEMsr-325; Service Project No. CWS-6. [California Institute of Technology.] February 24, 1943.
- M2** A system for the separation and purification of decigram quantities of chemical warfare agents. (Progress Report to March 30, 1945.) Clark W. Gould, Jr., and George Holzman. OEMsr-325; Service Project No. CWS-6; OSRD No. 5077. California Institute of Technology. May 17, 1945.
- M3** A course of instruction for the personnel of the Ultimate Analysis Section of the M-2 Chemical Laboratory company. (Progress Report to June 26, 1945.) E. H. Swift and Carl Niemann. OEMsr-325; Service Project No. CWS-6; OSRD No. 5434. California Institute of Technology. August 10, 1945.

414.1 Laboratory Equipment

- M1** The slope-o-meter, an instrument for the rapid determination of particle radius and concentration in the laboratory and field. (Division 10. Informal Report No. 10.2-15.) Victor K. LaMer

- and Seymore Hochberg. OEMsr-148; Service Project No. CWS-1. Columbia University. June 19, 1944.
- M2** The stainless-steel propane injector. (Progress Report to February 28, 1945.) Arnold O. Beckman, James D. McCullough and Robert A. Crane. OEMsr-674; Service Project No. CWS-6; OSRD No. 6042. [National Technical Laboratories,] September 13, 1945.
- M3** A syringe microburet. (Progress Report to August 1, 1945.) P. S. Farrington and Philip A. Shaffer, Jr. OEMsr-325; Service Project No. CWS-6; OSRD No. 6046. California Institute of Technology. September 13, 1945.
- M4** Constructional details of certain apparatus required for the laboratory identification of chemical warfare agents (Progress Report to September 1, 1945.) John A. Brockman, Jr., P. S. Farrington and others. OEMsr-325; Service Project No. CWS-6; OSRD No. 6184. California Institute of Technology. October 30, 1945.
- 415 Miscellaneous Chemical Compound Analyses**
- M1** Detection of mustard gas with 4-(*p*-nitrobenzyl) pyridine. Spray-type analytical gas scrubber. Catalytic toxicity of arsenical gases. (Final Report No. 78.) Weldon G. Brown. NDCrc-134; Service Project No. CWS-6; OSRD No. 140. University of Chicago. September 22, 1941.
- M2** Methods of chemical analysis. (Informal Monthly Reports covering the periods [from] January 8 to February 8, 1944 and January 10 to February 10, 1945.) John H. Yoe, Charles H. Lindsley and others. OEMsr-139. [University of Virginia,] February 8, 1944 and February 10, 1945.
- M3** Method for the determination of H and thiodiglycol in drops of dyed chargings. Determination of HN-1, HN-2, HN-3 and CG by potentiometric titrations. Cell for potentiometric determination of various gases in air. (Informal Progress Report [to] February 8, 1944.) John H. Northrop, Roger M. Herriott and John F. Gettemans. OEMsr-129; Service Project No. CWS-6; OSRD No. 3419. Rockefeller Institute for Medical Research. March 29, 1944.
- 420 Identification of Chemical Warfare Agents**
(See also: 410)
- M1** A system for the identification of functional groups present in chemical warfare agents. (Progress Report to June 5, 1945.) Clark W. Gould, Jr., George Holzman and John W. Sease. OEMsr-325; Service Project No. CWS-6; OSRD No. 5270. California Institute of Technology. June 26, 1945.
- 421 Methods of Identification**
- 421.1 Microscopical**
- M1** Microscopical identification of solid chemical warfare agents. (Progress Report to March 1, 1944.) Clyde W. Mason, Franklin A. Hamm and George B. DeLaMater. OEMsr-842; Service Project No. CWS-6; OSRD No. 3459. Cornell University. April 12, 1944.
- M2** Microscopical properties of derivatives of H, Q and related compounds with palladous chloride. (Progress Report to August 15, 1944.) Clyde W. Mason and George B. DeLaMater. OEMsr-842; Service Project No. CWS-6; OSRD No. 4107. Cornell University. September 7, 1944.
- M3** The microscopical identification of derivatives of certain chemical warfare agents. (Progress Report to January 30, 1945.) Clyde W. Mason and George B. DeLaMater. OEMsr-842; Service Project No. CWS-6; OSRD No. 4678. Cornell University. February 8, 1945.
- M4** Microscopical identification of derivatives of chemical warfare agents. (Progress Report to February 19, 1945.) Clyde W. Mason and George B. DeLaMater. OEMsr-842; Service Project No. CWS-6; OSRD No. 4727. Cornell University. February 22, 1945.
- M5** Microscopical identification of chemical warfare agents and their derivatives. (Final Report to February 28, 1945.) Clyde W. Mason. OEMsr-842; Service Project No. CWS-6; OSRD No. 4838. Cornell University. March 21, 1945.
- 421.2 Silica Gels**
- M1** The identification of samples of agents collected on plain silica gel. (Final Report to September 30, 1943.) Robert S. Livingston. OEMsr-79; Service Project No. CWS-6; OSRD No. 1896. University of Chicago. October 11, 1943.
- M2** A systematic scheme for the detection of toxics on plain silica tubes. (Progress Report to November 30, 1944.) D. S. Tarbell, R. B. Carlin and others. OEMsr-319; Service Project No. CWS-6; OSRD No. 4629. University of Rochester. January 24, 1945.
- 421.3 Acidic Elements**
- M1** A system for the ultimate analysis of chemical warfare agents. (Parts I and II. Final Report to February 1, 1944.) E. H. Swift and Carl Niemann. OEMsr-325; Service Project No. CWS-6; OSRD No. 3693. California Institute of Technology. May 29, 1944.
- M2** Qualitative tests for certain acidic elements in organic compounds. (Progress Report to May 4, 1945.) Edward L. Bennett and Clark W. Gould, Jr. OEMsr-325; Service Project No. CWS-6; OSRD No. 5076. California Institute of Technology. May 17, 1945.
- M3** A system for the ultimate analysis of chemical warfare agents. (Part III. Progress Report to June 22, 1945.) E. H. Swift and Carl Niemann. OEMsr-325; Service Project No. CWS-6; OSRD No. 5430. California Institute of Technology. August 10, 1945.

422 Identification of Specific Chemical Warfare Agents

- M1** Field tests for war chemicals in water. (Informal Report No. 55.) Arthur M. Buswell. OEMsr-593; Service Project No. CWS-14. University of Illinois. December 17, 1942.
- M2** Detection of chemical warfare agents in water and methods for their removal. (Final Report to May 23, 1944 and supplement.) M. C. Schwartz, F. L. Gayle and others. OEMsr-942; Service Project No. CWS-14; OSRD No. 3833. Louisiana State University. June 26, 1944.

422.1 Mustards**422.11 Sulfur Mustards, By means of:****422.111 Automatic Recording Devices**

- M1** A continuous recording meter for determining concentration of H. (Progress Report to February 28, 1945.) Lloyd B. Thomas, Henry E. Bent and others. OEMsr-312; Service Project No. CWS-6; OSRD No. 4839. University of Missouri. March 21, 1945.
- M2** Field sampling of H vapor with tape recorders. Donald E. Pearson, Robert J. Stell and others. OEMsr-79; Service Project No. CWS-6; OSRD No. 5470. University of Chicago. August 17, 1945.
- M3** An instrument for the continuous automatic recording of H concentrations in air. (Final Report to February 28, 1945.) Arnold O. Beckman, James D. McCullough and Robert A. Crane. OEMsr-674; Service Project No. CWS-6; OSRD No. 6044. National Technical Laboratories. September 13, 1945.
- M4** An automatic recording titrimeter for mustard. (Progress Report to August 1, 1945.) Anthony Briglio, Jr., John A. Brockman, Jr. and Philip A. Shaffer, Jr. OEMsr-325; Service Project No. CWS-6; OSRD No. 6183. California Institute of Technology. November 5, 1945.

422.112 Electrodes

- M1** Apparatus for automatic detection of H or other gases which react with bromine by means of the bromine electrode. (Progress Report to September 8, 1944.) John H. Northrop. OEMsr-129; Service Project No. CWS-6; OSRD No. 4308. Rockefeller Institute for Medical Research. October 31, 1944.
- M2** Portable apparatus for rapid estimation of H or other gases which react with bromine. (Progress Report to December 20, 1944.) John H. Northrop and John F. Gettemans. OEMsr-129; Service Project No. CWS-6; OSRD No. 4682. Rockefeller Institute for Medical Research. February 10, 1945.
- M3** The estimation of chloride by measuring the EMF of a silver, silver chloride, chloride ion half-cell for the purpose of estimating H or other toxics. (Progress Report to February 6, 1945.) John A. Brockman, Jr. and Thomas S. Lee. OEMsr-325;

Service Project No. CWS-6; OSRD No. 4798. California Institute of Technology. March 7, 1945.

- M4** The electrolytic titration of H using polarized platinum indicator electrodes. (Progress Report to August 1, 1945.) John W. Sease. OEMsr-325; Service Project No. CWS-6; OSRD No. 6048. California Institute of Technology. October 2, 1945.

422.113 Hot Wire

- M1** Methods for the detection of mustard gas. (Final Report No. 189, to February 1, 1942.) Henry E. Bent. NDCrc-89; OSRD No. 503. University of Missouri. [February (?) 1942.]

422.114 Reagent DB-3

- M1** Estimation of HS and of activated HS with the aid of DB-3. (Report No. 22.) Jonas S. Friedenwald and Heinz Herrmann. OEMcmr-24. Wilmer Institute. November 23, 1942.
- M2** Sensitivity of DB-3 tube of M-9 kit to mustard at various concentrations in air. (Progress Report to August 14, 1944.) F. H. MacDougall, David J. Lehmicke and others. OEMsr-1092; Service Project No. CWS-6; OSRD No. 4108. University of Minnesota. September 7, 1944.

422.115 DCT (Dichloramine-T)

- M1** A simple quantitative micro test for HS. (Report No. 2.) D. G. Cogan, V. Everett Kinsey and W. Morton Grant. OEMcmr-141. [Harvard University, Medical School.] July 17, 1942.
- M2** A method for increasing the sensitivity of micro-determination of HS. (Report No. 3.) D. G. Cogan, V. Everett Kinsey and W. Morton Grant. OEMcmr-141. [Harvard University, Medical School.] August 4, 1942.
- M3** A study of the chloramine T-o-tolidine method for the determination of H in 50% acetic acid. (Progress Report to January 19, 1945.) John W. Sease. OEMsr-325; Service Project No. CWS-6; OSRD No. 4680. California Institute of Technology. February 1, 1945.
- M4** The volumetric determination of H by means of chloramine-T or other oxidizing agents. (Progress Report to January 19, 1945.) Thomas S. Lee. OEMsr-325; Service Project No. CWS-6; OSRD No. 4679. California Institute of Technology. February 6, 1945.

422.116 Iodoplatinate

- M1** A study of the iodoplatinate method for the determination of H in 50% acetic acid. (Progress Report to December 8, 1944.) John W. Sease. OEMsr-325; Service Project No. CWS-6; OSRD No. 4600. California Institute of Technology. January 18, 1945.

422.117 Bubblers

- M1** The recovery of H vapor from air by bubblers

containing 50% acetic acid, diethyl phthalate, 0.5 N sulfuric acid, ethanol, or pyridine β' . (Progress Report to January 8, 1945.) Clark W. Gould, Jr., Carl Redemann and others. OEMsr-325; Service Project No. CWS-6; OSRD No. 4627. California Institute of Technology. January 25, 1945.

422.118 Miscellaneous Methods for Sulfur Mustards

- M1** Methods for the distinction and determination of HS and semi-H. (Report No. 10.) V. Everett Kinsey and W. Morton Grant. OEMcmr-141. Harvard University, Medical School. January 20, 1943.
- M2** The behavior of compounds related to H in the bromine, chloramine-T, iodoplatinate, mercurimetric and DB-3 methods for the determination of H. (Progress Report to September 12, 1944.) George Holzman, Thomas S. Lee and John W. Sease. OEMsr-325; Service Project Nos. CWS-6 and NL-B33; OSRD No. 4154. California Institute of Technology. September 20, 1944.

422.12 Nitrogen Mustards

- M1** A critical comparison of several detectors for the nitrogen mustards. (Informal Report No. 71.) Robert S. Livingston, Robert J. Stell and Leonard F. Swec. OEMsr-79; Service Project No. CWS-6. [University of Chicago.] April 27, 1943.
- M2** Drop reactions for the microscopical identification of nitrogen mustards. (Progress Report to August 4, 1944.) Clyde W. Mason and George B. DeLa-Mater. OEMsr-842; Service Project No. CWS-6; OSRD No. 3994. Cornell University. August 9, 1944.

422.121 Compounds 1070, 1120, 1130 and 1149

- M1** The detection of [Compounds] 1070 and 1130. (Informal Report No. 36.) Weldon G. Brown. [OEMsr-79.] University of Chicago. April 13, 1942.
- M2** An investigation of the reaction of Compounds 1070 and 1130 with certain inorganic ions and detector paints. (Progress Report No. 266, to May 7, 1942.) John H. Yoe. OEMsr-139; Service Project No. CWS-6; OSRD No. 681. University of Virginia. July 6, 1942.
- M3** The chemical detection of [Compound] 1120. (Progress Report No. 361, to July 1, 1942.) D. S. Tarbell. OEMsr-319; Service Project No. CWS-6; OSRD No. 879. University of Rochester. September 11, 1942.
- M4** Note on a possible indicator paper for [Compound] 1130. (Informal Report No. 52.) Robert S. Livingston and Leonard F. Swec. OEMsr-79; Service Project No. CWS-6. [University of Chicago.] November 17, 1942.
- M5** Colorimetric estimation of [Compound] 1149 vapor in air using DB-3 silica gel. (Informal Report No. 61.) R. G. Denkwalter and William R. Rem-

ington. OEMsr-79; Service Project No. CWS-6. [University of Chicago.] March 18, 1943.

422.122 HN-3

- M1** Potentiometric titrations of HN-3 solutions with silver nitrate. (Progress Report to July 1, 1944.) John H. Northrop. OEMsr-129; Service Project No. CWS-6; OSRD No. 3958. Rockefeller Institute for Medical Research. July 28, 1944.

422.13 Miscellaneous Identification Tests of Mustards

- M1** Adaptation of the DB-3 reagent for field detection. (Progress Report No. 339, to July 13, 1942.) Weldon G. Brown. OEMsr-79; Service Project Nos. CWS-6 and NL-B32; OSRD No. 832. University of Chicago. August 21, 1942.
- M2** The quantitative colorimetric (photometric) determination of HS [and Compounds] 1130 and 1070 with the DB-3 reagent. D. Wright Wilson, Samuel Gurin and Dana I. Crandall. OEMcmr-108. University of Pennsylvania. October 19, 1942.
- M3** The determination of HN-3 and of H by a mercurimetric titration of hydrolyzed chloride. (Progress Report to September 1, 1944.) Thomas S. Lee. OEMsr-325; Service Project Nos. CWS-6 and NL-B33; OSRD No. 4153. California Institute of Technology. September 21, 1944.
- M4** The quantitative determination of N-mustards and H in foods by means of the DB-3 method. (Report No. A-14.) Harry M. Vars, Erland C. Gjessing and others. OEMcmr-108. University of Pennsylvania. October 25, 1944.
- M5** The colorimetric estimation of H and HN-3 with DB-3. (Progress Report to September 30, 1944.) George Holzman. OEMsr-325; Service Project No. CWS-6; OSRD No. 4288. California Institute of Technology. October 27, 1944.

422.2 Arsenicals, By Means of:

- M1** Drop reactions for the microscopical identification of arsenical chemical warfare agents. (Progress Report to March 1, 1944.) Clyde W. Mason. OEMsr-842; Service Project No. CWS-6; OSRD No. 3804. Cornell University. May 22, 1944.

422.21 DBT (Thiocarbazones)

- M1** The use of dithiazone as a detector for M-1 and ED in the vapor state. (Technical Report No. 5.) Warren C. Johnson. University of Chicago. [March 28, 1941.]
- M2** Examination of the thiocarbazones for use in the colorimetric determination of arsenicals. (Progress Report to May 5, 1943.) J. P. McReynolds. OEMsr-301; Service Project No. CWS-6; OSRD No. 1548. Ohio State University. June 29, 1943.
- M3** The detection of certain arsenical agents in water by means of dibiphenylthiocarbazone. (Progress Report to May 25, 1943.) Charles C. Price and Arthur M. Buswell. OEMsr-593; OSRD No. 1583. University of Illinois. July 10, 1943.

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- M4** The use of thiocarbazones as arsenical detectors. D. S. Tarbell, C. W. Todd and others. OEMsr-319; Service Project No. CWS-6; OSRD No. 3670. University of Rochester. May 24, 1944.
- M5** A pellet DBT test for lewisite and similar arsenical chemical warfare agents in water. (Progress Report to June 6, 1944.) Charles C. Price, Bernard H. Velzen and William G. Jackson. OEMsr-593; Service Project No. CWS-14; OSRD No. 3829. University of Illinois. June 26, 1944.
- M6** The reaction between DBT and arsenicals. (Progress Report to November 30, 1944.) D. S. Tarbell and J. F. Bunnett. OEMsr-319; Service Project No. CWS-6; OSRD No. 4677. University of Rochester. January 31, 1945.
- 422.22 Volumetric Method**
- M1** Determination of arsenicals by a dichromate volumetric method. (Progress Report to May 25, 1943.) J. P. McReynolds. OEMsr-301; Service Project No. CWS-6; OSRD No. 1547. Ohio State University. June 29, 1943.
- 422.23 Detector Tubes and Gels**
- M1** A direct specific detector for arsenical vapors. (Progress Report to May 8, 1943.) Robert S. Livingston. OEMsr-79; Service Project No. CWS-6; OSRD No. 1401. University of Chicago. May 11, 1943.
- M2** Cuprous iodide-impregnated silica gel as a specific detector for lewisite. (Informal Report No. 84.) C. A. Erickson. OEMsr-87. [University of Chicago.] September 4, 1943.
- M3** Sensitivity of arsenical detector tubes of M-9 kit to L, PD and ED. (Progress Report to November 6, 1944.) F. H. MacDougall, David J. Lehmicke and others. OEMsr-1092; Service Project No. CWS-6; OSRD No. 4335. University of Minnesota. November 9, 1944.
- 422.24 Miscellaneous Reagents**
- M1** Detection of lewisite and ethyl dichloroarsine with tetramethyldiaminodiphenylmethane. (Informal Report No. 38.) John H. Yoe and Everett C. Cogbill. University of Virginia. April 17, 1942.
- M2** Organic reagents for L and ED. (Progress Report to November 27, 1943.) John H. Yoe and Everett C. Cogbill. OEMsr-139; Service Project No. CWS-6; OSRD No. 3111. University of Virginia. January 13, 1944.
- 422.3 Fluorine Compounds**
- M1** Colorimetric determination of fluorine in fluoro-organic compounds. (Progress Report to March 6, 1944.) John H. Yoe and Lyle G. Overholser. OEMsr-139; Service Project No. CWS-6; OSRD No. 3480. University of Virginia. April 14, 1944.
- M2** Determination of fluorine in fluoro-organic compounds. (Progress Report to February 29, 1944 and supplement.) John H. Yoe, Jason M. Salsbury and James W. Cole. OEMsr-139; Service Project No. CWS-6; OSRD No. 3481. University of Virginia. April 14, 1944.
- M3** Determination of fluorine in fluoro-organic compounds in low concentrations in air. (Formal Report to June 6, 1944 and supplement.) John H. Yoe, Jason M. Salsbury and James W. Cole. OEMsr-139; Service Project No. CWS-6; OSRD Nos. 3830 and 3830A. University of Virginia. June 27, 1944.
- M4** Determination of fluorine in certain fluoro-organic compounds in water. (Progress Report to November 20, 1944.) John H. Yoe, Jason M. Salsbury and James W. Cole. OEMsr-139; Service Project No. CWS-6; OSRD No. 4414. University of Virginia. November 30, 1944.
- 422.31 Fluorophosphates**
- M1** Note on the detection of dimethylfluorophosphate. (Informal Report No. 50.) Robert S. Livingston and R. G. Denkwalter. OEMsr-79 and OEMsr-87; Service Project No. CWS-6. [University of Chicago.] November 13, 1942.
- M2** Micro reactions for the identification of fluorophosphates. (Progress Report to February 27, 1945.) Clyde W. Mason and George B. DeLaMater. OEMsr-842; Service Project No. CWS-6; OSRD No. 4837. Cornell University. March 21, 1945.
- 422.4 Cyanogens and Allied Compounds**
- 422.41 Cyanogen Chloride**
- M1** The quantitative analysis for CK in water by the DB-3 procedure. (Progress Report to February 28, 1945.) Charles C. Price and Alvin C. Wiese. OEMsr-593; Service Project No. CWS-6; OSRD No. 4836. University of Illinois. March 20, 1945.
- 422.42 Hydrocyanic Acid**
- M1** The sampling and estimation of AC in the presence of titanium tetrachloride, chlorosulfonic acid and sulfur trioxide smokes. (Progress Report to June 11, 1945.) George Holzman. OEMsr-325; Service Project No. CWS-6; OSRD No. 5451. California Institute of Technology. August 17, 1945.
- 422.43 MCE**
- M1** The determination of MCE. (Progress Report to September 1, 1945.) Thomas S. Lee and John W. Sease. OEMsr-325; Service Project No. CWS-6; OSRD No. 6118. California Institute of Technology. October 16, 1945.
- 422.5 Chlorpicrin**
- M1** The microscopical identification of chlorpicrin. (Progress Report to November 1, 1944.) Clyde W. Mason and George B. DeLaMater. OEMsr-842; Service Project No. CWS-6; OSRD No. 4309. Cornell University. November 3, 1944.

422.6 Analysis of Smokes

- M1** The analysis of smokes. (Progress Report to May 25, 1944.) Henry E. Bent and Anna Jane Harrison. OEMsr-312; Service Project No. CWS-6; OSRD No. 3820. University of Missouri. June 3, 1944.
- M2** The analysis of smokes. (Progress Report to February 28, 1945.) Henry E. Bent and Anna Jane Harrison. OEMsr-312; Service Project No. CWS-6; OSRD No. 4987. University of Missouri. April 25, 1945.

422.7 Carbon Monoxide

- M1** A simple thermometric apparatus for the detection and estimation of carbon monoxide in air. (Progress Report No. 294, to May 15, 1942.) John H. Yoe. OEMsr-134; Service Project No. NA-106; OSRD No. 748. University of Virginia. July 17, 1942.
- M2** Microgravimetric method for the determination of carbon monoxide. (Informal Progress Report No. 72.) John H. Yoe, James W. Cole and others. OEMsr-139; Service Project No. CWS-6. University of Virginia. May 1, 1943.
- M3** Carbon monoxide detection. (Informal Monthly Progress Report (A) covering the period [from] May 10 to June 10, 1943.) John H. Yoe, James W. Cole and others. OEMsr-139. [University of Virginia.] June 10, 1943.
- M4** The development of a spectrophotometric carbon monoxide-indicating instrument using hemoglobin. (Formal Report to June 30, 1943.) Linus C. Pauling. OEMsr-753; Service Project Nos. NA-106 and AC-59; OSRD No. 1885. California Institute of Technology. [July (?) 1943.]
- M5** A continuous thermometric apparatus for carbon monoxide detection. (Final Report to June 28, 1943.) John H. Yoe and Charles H. Lindsley. OEMsr-139; Service Project Nos. NA-106 and AC-59; OSRD No. 1743. University of Virginia. August 30, 1943.
- M6** A photoelectric instrument for the colorimetric detection and determination of carbon monoxide. (Final Report to August 20, 1943.) John H. Yoe, James W. Cole and Jason M. Salsbury. OEMsr-139; Service Project Nos. NA-106 and AC-59; OSRD No. 1787. University of Virginia. September 10, 1943.
- M7** Carbon monoxide indicators of the impregnated silica gel type. (Progress Report to September 30, 1943.) John H. Yoe, James W. Cole and Jason M. Salsbury. OEMsr-139; Service Project Nos. NA-106 and AC-59; OSRD No. 1958. University of Virginia. October 25, 1943.
- M8** Studies in carbon monoxide detection. (Final Report to October 6, 1943.) John H. Yoe, James W. Cole and Jason M. Salsbury. OEMsr-139; Service Project Nos. NA-106 and AC-59; OSRD No. 1959. University of Virginia. November 1, 1943.

- M9** Acidimetric and iodometric methods for analysis of carbon monoxide in air. (Progress Report to January 21, 1944.) John H. Yoe and Charles H. Lindsley. OEMsr-139; Service Project No. CWS-6; OSRD No. 3410. University of Virginia. March 27, 1944.
- M10** Development of a direct-indicating carbon monoxide instrument. (Final Report to August 31, 1944.) George A. Perley and R. H. Cherry. OEMsr-670; Service Project Nos. NA-106 and AC-59; OSRD No. 4111. Leeds and Northrup Company, Inc. September 8, 1944.
- M11** Determination of carbon monoxide in air. (Progress Report to February 28, 1945.) Arnold O. Beckman, James D. McCullough and Robert A. Crane. OEMsr-674; Service Project No. CWS-6; OSRD No. 6043. [National Technical Laboratories (?)] September 13, 1945.

422.8 Identification of Chemical Warfare Agent Combinations

- M1** An investigation of the reactions between beta, beta' dichlorodiethyl sulfide, beta chlorovinyl dichloroarsine, ethyl dichloroarsine, diphenylamine chloroarsine and certain inorganic ions. (Final Report No. 62, to July 21, 1941.) John H. Yoe. NDCrc-172; Service Project No. CWS-6; OSRD No. 124. University of Virginia. August 23, 1941.
- M2** Potentiometric titration of small amounts of M-1, HS, ED or DM. (Progress Report No. 183, to December 29, 1941.) John H. Northrop. OEMsr-129; Service Project No. CWS-6; OSRD No. 401. Rockefeller Institute for Medical Research. February 21, 1942.
- M3** Detection of HS, M-1, ED or PDA with trained dogs or rats. (Progress Report No. 222, to March 31, 1942.) John H. Northrop, E. Shears and John F. Gettemans. OEMsr-129; Service Project No. CWS-2; OSRD No. 493. Rockefeller Institute for Medical Research. April 10, 1942.
- M4** Volumetric methods for the determination of small quantities of HS, Q, T, M-1, ED, DM and PDA. (Progress Report No. 225, to April 11, 1942.) John H. Northrop. OEMsr-129; Service Project No. CWS-6; OSRD No. 516. Rockefeller Institute for Medical Research. April 20, 1942.
- M5** Analytical and inorganic problems [in detection of toxics]. (Informal Monthly Report [covering the period from] June 16 [to] July 15, 1942.) Weldon G. Brown. OEMsr-79. University of Chicago. [July 15, 1942.]
- M6** Behavior of thickened vesicants with detector paints. (Informal Progress Report No. 46.) John H. Yoe. [OEMsr-139.] [University of Virginia.] [August 3, 1942.]
- M7** Titration of HS, Q, T, M-1, ED and PDA with hypochlorite and methyl red. (Progress Report No. 225a, to August 25, 1942.) John H. Northrop. OEMsr-129; Service Project No. CWS-6; OSRD No.

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864. Rockefeller Institute for Medical Research. September 7, 1942.

- M8** Biological methods for determination of M-1 and DH in solutions and in air. (Final Report No. 438, to September 1, 1942.) Herbert S. Gasser. NDCrc-151; Service Project No. CWS-6; OSRD No. 1060. Rockefeller Institute for Medical Research. November 25, 1942.

- M9** Determination of HS, M-1 and other gases in air, at a distance from the operator. (Informal Progress Report [to], March 20, 1943.) John H. Northrop. OEMsr-129; Service Project No. CWS-2; OSRD No. 1444. Rockefeller Institute for Medical Research. May 21, 1943.

- M10** Detection of mustards by hot-wire or furnace oxidation and rapid analytical determination of arsenicals by reaction with thiocarbazonates or by oxidation with dichromate. (Final Report to July 1, 1943.) J. P. McReynolds. OEMsr-301; Service Project No. CWS-6; OSRD No. 1576. Ohio State University. July 8, 1943.

- M11** Quantitative methods for the determination of certain chemical warfare agents in water. (Progress Report to July 10, 1944.) Arthur M. Buswell, Charles C. Price and Alvin C. Wiese. OEMsr-593; Service Project No. CWS-14; OSRD No. 3979. University of Illinois. July 19, 1944.

- M12** Automatic titrator for the determination of H, L and other gases in air. Supplement No. 4, Determination of HN-3 with sodium hydroxide after decomposition. (Informal Progress Report to September 5, 1944.) John H. Northrop and John F. Gettemans. OEMsr-129; Service Project No. CWS-6; OSRD No. 4310. Rockefeller Institute for Medical Research. October 31, 1944.

- M13** Determination of HS, M-1 and other gases in air at a distance from the operator. Supplement No. 2, Determination of HN-3 with sodium hydroxide. (Informal Progress Report to September 1, 1944.) John H. Northrop and John F. Gettemans. OEMsr-129; Service Project No. CWS-6; OSRD No. 4311. Rockefeller Institute for Medical Research. October 31, 1944.

- M14** The detection of organic fluorine toxics. The use of thiocarbazonates as arsenical detectors. (Final Report to February 28, 1945.) Nathan L. Drake. OEMsr-715; Service Project No. CWS-6; OSRD No. 4843. University of Maryland. April 19, 1945.

500 PROTECTION AGAINST CHEMICAL WARFARE AGENTS

- M1** [The effect of therapeutic agents on vesication,] David P. Barr and Marion B. Sulzberger. OEMcmr-103. Cornell University, Medical College. September 1, 1942.

- M2** Treatment of gas casualties. Marion B. Sulzberger and David P. Barr. [OEMcmr-103.] [Cornell University, Medical College.] November 20, 1942.

- M3** Determination of: The irritancy of protective oint-

ments. The vesicant properties of contaminated carbon protective fabrics. The stability of CC-2 impregnated herringbone twill patches under conditions of semi-tropical wear. (Final Report to October 31, 1945.) Herbert O. Calvery, Carter D. Johnston and others. Service Project Nos. CWS-24 and NL-B27; OSRD No. 6408. Federal Security Agency. March 8, 1946.

510 Prophylactic and Therapeutic Ointments (See also: 520)

- M1** Non-irritant protective ointments. (Progress Report to February 1, 1944.) Paul L. Salzberg, W. A. Lazier and W. J. Peppel. OEMsr-377; Service Project No. CWS-4; OSRD No. 3821. E. I. duPont de Nemours and Company, Inc. July 1, 1944.

511 Chloroamides (See also: 541.2)

- M1** Determination of the thermal stability of chloroamides and of powders, creams and ointments containing them. (Progress Report to October 26, 1942.) Homer Adkins. OEMsr-304; OSRD No. 1283. University of Wisconsin. March 22, 1943.

- M2** Tests of chloroamide-containing ointments for protection and decontamination of human skin against vesicants. (Progress Report to January, 1944.) Joseph Savit, John F. Thomson and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 3386. University of Chicago. March 21, 1944.

511.1 S-328

- M1** The laboratory preparation of S-328. (Progress Report to November 10, 1942.) (n.a.) OEMsr-644; Service Project Nos. CWS-4 and NL-B27; OSRD No. 4216. Commercial Solvents Corporation. October 6, 1944.

511.2 S-330

- M1** Protective and therapeutic agents for war gases. Pigmented protective ointments. (Progress Report to November 15, 1944.) Paul L. Salzberg, W. A. Lazier and W. J. Peppel. OEMsr-377; Service Project Nos. CWS-24 and NL-B27; OSRD No. 4372. E. I. duPont de Nemours and Company, Inc. November 22, 1944.

- M2** The preparation of S-330 and related compounds. (Progress Report to June, 1944.) Homer Adkins, James E. Carnahan and others. OEMsr-304; Service Project Nos. CWS-24 and NL-B27; OSRD No. 4591. University of Wisconsin. January 19, 1945.

- M3** The preparation of S-330. (Final Report to January 10, 1944.) L. P. Kyrides, O. J. Weinkauff and others. OEMsr-1157; Service Project Nos. CWS-24 and NL-B27; OSRD No. 6109. Monsanto Chemical Company. October 16, 1945.

511.3 S-461

- M1** The preparation of S-461 from methyl ethyl ketone. (Progress Report No. 435, to October 27, 1942.) Homer Adkins. OEMsr-304; Service Project Nos. CWS-24 and NL-B27; OSRD No. 1057. University of Wisconsin. November 30, 1942.
- M2** A summary of research and development work in connection with the preparation and use of S-461 as a protective agent against mustard. (Progress Report No. 461, to December 9, 1942.) Homer Adkins. OEMsr-304; Service Project Nos. CWS-24, NL-B27 and NL-B30; OSRD No. 1118. University of Wisconsin. December 9, 1942.
- M3** Comparisons between S-461 in watery suspensions, in powder vehicles and in the standard ointment base in both early decontamination and protection of rabbit and human skin against mustard burns. (n.a.) OEMcmr-103. [Cornell University, Medical College.] April 8, 1943.
- M4** The laboratory and semi-plant preparation of S-461. (Progress Report to November 25, 1942.) (n.a.) OEMsr-644; Service Project Nos. CWS-24 and NL-B27; OSRD No. 3356. Commercial Solvents Corporation. March 25, 1944.
- M5** The preparation of S-461 from methyl ethyl ketone. (Progress Report to September, 1944.) Homer Adkins, James E. Carnahan and A. L. Wilds. OEMsr-304; Service Project Nos. CWS-4, CWS-24 and NL-B27; OSRD No. 4305. University of Wisconsin. November 2, 1944.

511.4 Miscellaneous Chloroamides

- M1** The preparation, stability and irritancy of protective ointments. (Progress Report to September, 1943.) Homer Adkins, E. Earl Royals and A. L. Wilds. OEMsr-304; Service Project Nos. CWS-4 and NL-B27; OSRD No. 4419. University of Wisconsin. December 2, 1944.
- M2** Development of protective ointments. (Final Report to November 1, 1944.) Walter H. Hartung and Warren E. Weaver. OEMsr-1006; Service Project Nos. CWS-24 and NL-B27; OSRD No. 4768. University of Maryland. March 3, 1945.
- M3** Preparation of the chloroamides, S-461, S-328, S-330, S-426, S-222, S-300, S-221, S-436 and Decontaminant 40. (Final Report to August 31, 1945.) Randolph T. Major, W. H. Engels and others. OEMsr-742; Service Project Nos. CWS-24 and NL-B27; OSRD No. 6111. Merck and Company, Inc. October 17, 1945.

512 Peroxides

- M1** Urea peroxide as a possible decontaminant for M-1 and HS. (Progress Report No. 188, to February 11, 1942.) Paul D. Bartlett. NDCrc-136; Service Project Nos. NL-B30 and NL-B31; OSRD No. 469. Harvard University. March 28, 1942.
- M2** A study of peroxides suitable for the treatment of M-1 burns. (Progress Report No. 302, to July 13,

1942.) Morris S. Kharasch. OEMsr-394; OSRD No. 749. University of Chicago. July 24, 1942.

- M3** Peroxides suitable for the treatment of M-1 burns. (Progress Report to February 24, 1943.) Morris S. Kharasch and S. Weinhouse. OEMsr-394; Service Project No. CWS-4; OSRD No. 1390. University of Chicago. May 4, 1943.
- M4** The kinetics of oxidation of β , β' -dichlorodiethylsulfide and thiodiglycol. (Progress Report to May 13, 1943.) Paul D. Bartlett and Sidney D. Ross. NDCrc-136; Service Project No. NL-B31; OSRD No. 1672. Harvard University. August 5, 1943.

513 BAL Ointments

513.1 Preparation and Analysis

- M1** Preparation of BAL. (Progress Report No. 456, to December 1, 1942.) (n.a.) OEMsr-377; Service Project No. CWS-4; OSRD No. 1111. E. I. duPont de Nemours and Company, Inc. December 8, 1942.
- M2** Experimental manufacture and process study of BAL. (Progress Report No. 474, to December 1, 1942.) W. S. Calcott. OEMsr-760; Service Project No. CWS-4; OSRD No. 1221. E. I. duPont de Nemours and Company, Inc. December 8, 1942.
- M3** The resolution of BAL. (Final Report to September, 1943.) H. R. Snyder. OEMsr-607; Service Project No. CWS-4; OSRD No. 2056. University of Illinois. November 25, 1943.

513.2 Derivatives

- M1** Water-soluble BAL derivatives. (Progress Report to April 3, 1942.) Morris S. Kharasch. OEMsr-374; Service Project No. CWS-4; OSRD No. 1379. University of Chicago. May 1, 1943.
- M2** Protective and therapeutic agents for war gases. BAL derivatives and analogs. (Progress Report to July 1, 1944.) Paul L. Salzberg, W. A. Lazier and others. OEMsr-377; Service Project No. CWS-4; OSRD No. 4604. E. I. duPont de Nemours and Company, Inc. January 22, 1945.
- M3** Analogs and derivatives of BAL. (Progress Report to September 30, 1945.) Paul L. Salzberg, B. W. Howk and W. H. Vinton. OEMsr-377; Service Project No. CWS-4; OSRD No. 5978. E. I. duPont de Nemours and Company, Inc. January 15, 1946.

513.3 Vehicles

- M1** Committee on Medical Research-NDRC joint project on BAL ointment. Report on the work of the Pharmaceutical and Chemical Sub-Committee for the period January through April, 1943. (Progress Report to June 23, 1943.) W. A. Lazier. OEMsr-377; Service Project No. CWS-4; OSRD No. 1652. E. I. duPont de Nemours and Company, Inc. July 28, 1943.
- M2** Protective and therapeutic agents for war gases. Solutions of BAL. (Progress Report to January 1,

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1945.) Paul L. Salzberg, W. A. Lazier and others. OEMsr-377; Service Project No. CWS-4; OSRD No. 4888. E. I. duPont de Nemours and Company, Inc. April 2, 1945.

513.4 Evaluation

- M1** The failure of BAL ointment to inhibit vesication produced by heat and tincture of cantharides. (Report No. B-15.) Marion B. Sulzberger, Rudolf L. Baer and others. OEMcmr-103. Cornell University, Medical College. March 17, 1944.

514 Acid Ointments

514.1 Pyruvic Acid Starch Paste

- M1** The use of pyruvic acid in the treatment of burns. (Progress Report No. 14.) Samuel C. Harvey, Gervase J. Connor and Lena C. Alogna. OEMcmr-83. Yale University. May 2, 1944.
- M2** The effect of applications of pyruvic acid starch paste on the rate of healing of mustard gas lesions. (Report No. B-29.) Marion B. Sulzberger, Rudolf L. Baer and Abram Kanof. OEMcmr-103. Cornell University, Medical College. September 5, 1944.
- M3** The comparative effects of pyruvic acid starch paste and blank starch paste in the treatment of chemical burns. (Report No. B-33.) Marion B. Sulzberger, Rudolf L. Baer and Abram Kanof. OEMcmr-103. Cornell University, Medical College. February 10, 1945.
- M4** The effect of slough removal with pyruvic acid starch paste on the rate of healing of chemical burns. (Report No. B-35.) Marion B. Sulzberger, Rudolf L. Baer and Abram Kanof. OEMcmr-103. Cornell University, Medical College. February 14, 1945.
- M5** Pyruvic acid starch paste followed by sulfadiazine ointment compared with sulfadiazine ointment alone in the treatment of chemical burns. (Report No. B-36.) Marion B. Sulzberger, Rudolf L. Baer and Abram Kanof. OEMcmr-103. Cornell University, Medical College. February 14, 1945.
- M6** Comparative effects of dry dressings and of sodium sulfadiazine ointment applied to chemical burns subsequent to treatment with pyruvic acid starch paste. (Report No. B-37.) Marion B. Sulzberger, Rudolf L. Baer and Abram Kanof. OEMcmr-103. Cornell University, Medical College. February 14, 1945.
- M7** The effect of pyruvic acid treatment on the healing rate of standard experimental thermal burns. (Report No. B-40.) Marion B. Sulzberger, Rudolf L. Baer and Abram Kanof. OEMcmr-103. Cornell University, Medical College. April 11, 1945.
- M8** Comparison of the course of chemical and thermal burns under pyruvic acid starch paste treatment. (Report No. B-43.) Marion B. Sulzberger, Rudolf L. Baer and Abram Kanof. OEMcmr-103. Cornell University, Medical College. May 11, 1945.

- M9** The comparative effects of pyruvic acid starch paste and blank starch paste in the treatment of thermal burns. (Report No. B-45.) Marion B. Sulzberger, Rudolf L. Baer and others. OEMcmr-103. Cornell University, Medical College. June 5, 1945.

514.2 Succinic Acid

- M1** Promotion of healing in residual lesions after primary treatment of tissues exposed to vesicant gases. (Progress Report Nos. 12 and 13.) Samuel C. Harvey, Gervase J. Connor and Lena C. Alogna. OEMcmr-83. [Yale University.] December 1, 1943 and March 10, 1944.

514.3 Vehicles for Acids

- M1** Investigations on vehicles to replace starch paste in the acid treatment of burns. First series of experiments. (Report No. B-39.) Marion B. Sulzberger, Rudolf L. Baer and Abram Kanof. OEMcmr-103. Cornell University, Medical College. February 28, 1945.
- M2** Methods for biologic and laboratory tests of vehicles proposed for use in the acid treatment of burns. (Report No. B-44.) Marion B. Sulzberger, Rudolf L. Baer and others. OEMcmr-103. Cornell University, Medical College. June 4, 1945.
- M3** Investigations on vehicles to replace starch paste in the acid treatment of burns. Second series of experiments. (Report No. B-46.) Marion B. Sulzberger, Rudolf L. Baer and others. OEMcmr-103. Cornell University, Medical College. June 7, 1945.

514.4 Miscellaneous Acid Ointments

- M1** The effect of applications of various acids in starch paste on the rate of healing of chemical burns. (Report No. B-32.) Marion B. Sulzberger, Rudolf L. Baer and others. OEMcmr-103. Cornell University, Medical College. February 5, 1945.
- M2** The comparative effects of applications of phosphoric, pyruvic and tartaric acids on the rate of healing of chemical burns. (Report No. B-41.) Marion B. Sulzberger, Rudolf L. Baer and Abram Kanof. OEMcmr-103. Cornell University, Medical College. April 13, 1945.
- M3** The comparative effects of applications of phosphoric, pyruvic and tartaric acids on the rate of healing of thermal burns. (Report No. B-42.) Marion B. Sulzberger, Rudolf L. Baer and Abram Kanof. OEMcmr-103. Cornell University, Medical College. April 17, 1945.

515 Miscellaneous Ointments

- M1** [The effect of wetting agents on therapeutic agents.] Survey report of Project No. M-906. David P. Barr and Marion B. Sulzberger. [OEMcmr-103.] [Cornell University, Medical College.] April 20, 1942.
- M2** Letter to Brigadier General W. C. Kabrich. Subject: Report of the special committee appointed to

investigate decontaminant ointments A and B. C. Sidney Burwell, Ernest W. Goodpasture and Joseph G. Hopkins. February 5, 1943.

M3 The relative efficacy of horse serum followed by heat lamp and of sulfadiazine ointment in the treatment of chemical burns. (Report No. B-34.) Marion B. Sulzberger, Rudolf L. Baer and Abram Kanof. OEMcmr-103. Cornell University, Medical College. February 12, 1945.

M4 Further experiments on the treatment of chemical burns with silver nitrate 1/3% ointment. (Report No. B-38.) Marion B. Sulzberger, Rudolf L. Baer and Abram Kanof. OEMcmr-103. Cornell University, Medical College. February 16, 1945.

M5 Protective and therapeutic agents for war gases. (Final Summary Report to September 30, 1945.) Paul L. Salzberg, B. W. Howk and others. OEMsr-377; Service Project No. CWS-4; OSRD No. 6438. E. I. duPont de Nemours and Company, Inc. January 15, 1946.

520 Treatments for Specific Agents (See also: 510)

521 Fluorophosphates

M1 The decontamination of dialkyl fluorophosphates. (Progress Report to January 9, 1943.) Homer Adkins and A. L. Wilds. OEMsr-304; Service Project Nos. CWS-4 and NL-B30; OSRD No. 1295. University of Wisconsin. March 24, 1943.

M2 The protection of PF-3 poisoned rats and mice by the systemic administration of drugs. (Report No. 42.) Jonas S. Friedenwald and Roy O. Scholz. OEMcmr-24. Wilmer Institute. October 19, 1943.

522 Mustards

M1 Work done on the Wound Healing Project. (Report covering the period from April 20 to June 25, 1942.) (n.a.) OEMcmr-108. University of Pennsylvania. June (?) 1942.

M2 Chemical studies relating to the behavior of certain vesicants and to the search for antidotes. (Informal Report No. 2, for the period from January 15 to August 31, 1942.) Leslie Hellerman. OEMsr-94; Service Project No. CWS-2. Johns Hopkins University. September, 1942.

M3 Tests for decontamination of mustard and nitrogen mustards on human skin. (Progress Report to December 12, 1944.) Eugene Goldwasser, Peter P. H. DeBruyn and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 4638. University of Chicago. January 27, 1945.

M4 Protective and therapeutic agents for war gases. [Part] II, Therapeutic agents for mustard and nitrogen mustards. (Progress Report to September 30, 1945.) Paul L. Salzberg, W. A. Lazier and others. OEMsr-377; Service Project No. CWS-4; OSRD No. 5979. E. I. duPont de Nemours and Company, Inc. January 10, 1946.

522.1 Sulfur Mustards

522.11 Treatment with BAL

M1 Experiments on the inhibitory effect of BAL on vesication produced with liquid mustard gas. (Report No. B-7.) Marion B. Sulzberger, Rudolf L. Baer and others. OEMcmr-103. Cornell University, Medical College. January 3, 1944.

M2 The effects of the successive use of chlorinating ointment and BAL ointment in the decontamination and treatment of skin sites exposed to liquid mustard gas. (Report No. B-11.) Marion B. Sulzberger, Rudolf L. Baer and others. OEMcmr-103. Cornell University, Medical College. January 17, 1944.

M3 Effect of BAL on respiration and glycolysis of H-treated rat skin. E. S. Guzman Barron and Joe Meyer. OEMcmr-57. [University of Chicago.] January 21, 1944.

M4 The use of BAL ointment in rabbits' eyes contaminated with liquid H compared to simple irrigation. (Report No. 37.) Francis Heed Adler, Irving H. Leopold and William O. LaMotte, Jr. OEMcmr-9. University of Pennsylvania. July 31, 1944.

M5 The inhibition of vesiculation in mustard gas, H, lesions of human skin by BAL. (Final Report to March, 1945.) Philip D. McMaster, George H. Hogeboom and others. OEMsr-434; Service Project No. CWS-2; OSRD No. 5027. Rockefeller Institute for Medical Research. May 3, 1945.

522.12 Miscellaneous Sulfur Mustard Treatments

M1 [The modification by drugs or chemicals of the interaction of war gases and irritants with tissues.] William T. Salter. OEMcmr-51. Yale University. April 17, 1942.

M2 Treatment of gas casualties. (Monthly Progress Report No. 3.) Marion B. Sulzberger. [OEMcmr-103.] [Cornell University, Medical College.] June 30, 1942.

M3 [Pharmacology of H and therapeutic agents for H other than simple surface decontaminants.] (Bulletin D.) William T. Salter. OEMcmr-51. Yale University. September 1, 1942.

M4 [Treatments for DH and derivatives.] (Informal monthly progress reports.) Eric G. Ball, Ralph W. McKee and others. OEMsr-86. [Harvard University, Medical School.] [November 28] and December 19, 1942; May 10 and August 10, 1943.

M5 Tests of intravenous prophylaxis against intravenously administered H substance. (Informal Progress Report No. 22.) William T. Salter, A. D. Bass and others. OEMcmr-51. [Yale University.] December 1, 1942.

M6 Tests of possible therapeutic agents for H burns on skin. (Informal Progress Report No. 21.) William T. Salter, A. D. Bass and others. OEMcmr-51. [Yale University.] December 31, 1942.

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- M7** Tests of possible therapeutic agents for H burns on skin. Organic compounds containing sulfur. (Informal Progress Report No. 35.) William T. Salter and V. J. Tucker. OEMcmr-51. [Yale University.] May 28, 1943.
- M8** Studies on the decontamination of liquid mustard on human skin. Timothy R. Talbot, Jr. and Leslie Nicholas. OEMcmr-108. University of Pennsylvania. July 21, 1943.
- M9** The effects of pressure bandages on the progress of mustard gas lesions on human skin. Comparison of the effects of pressure bandages with boric acid ointment and 5% sulfathiazole ointment in the treatment of nine-day-old ulcerative liquid mustard gas lesions on human skin. (Report No. B-2.) Marion B. Sulzberger, Rudolf L. Baer and others. OEMcmr-103. Cornell University, Medical College. August 27, 1943.
- M10** Studies of the effects of HS on the skin of the rat. [Part] XXV, The effect of treatment with Vitamin A. (Report No. 26.) Maurice Sullivan. OEMcmr-82. [Johns Hopkins University.] September 1, 1943.
- M11** Definitive (late) treatment of vesicular mustard gas lesions of human skin. (Report No. B-5.) Marion B. Sulzberger, Rudolf L. Baer and Robert B. Hallborg. OEMcmr-103. Cornell University, Medical College. November 3, 1943.
- M12** Time factor in decontamination with modern powders and ointments. (Informal Progress Report No. 46.) V. J. Tucker and William T. Salter. OEMcmr-51. [Yale University.] November 15, 1943.
- M13** Preparation and testing of substances as neutralizing or therapeutic agents for H burns. (Formal Report for the period [from] September 1, 1942 to August 31, 1943.) Karl A. Folkers, Richard F. Phillips and others. OEMsr-750; Service Project No. CWS-2; OSRD No. 3249. Merck and Company, Inc. February 15, 1944.
- M14** Definitive (late) treatment of mustard gas lesions with silver nitrate 1/3% in petrolatum. (Report No. B-13.) Marion B. Sulzberger, Rudolf L. Baer and Abram Kanof. OEMcmr-103. Cornell University, Medical College. March 9, 1944.
- M15** A study of the ability of compounds with high competition factors to counteract the injurious effects of mustard gas. (Progress Report [to] August 26, 1943.) Eric G. Ball, Jack M. Buchanan and others. OEMsr-86; Service Project No. CWS-2; OSRD No. 3366. Harvard University. March 16, 1944.
- M16** Effects of penicillin on mustard gas lesions on human skin. (Report No. B-16.) Marion B. Sulzberger, Rudolf L. Baer and Abram Kanof. OEMcmr-103. Cornell University, Medical College. March 31, 1944.
- M17** Investigation of detoxicants or decontaminants for mustard gas. Enzyme studies and other chemical studies bearing upon the action of certain vesicants. (Final Report to June 30, 1943.) Leslie Hellerman, Curt C. Porter and others. OEMsr-94; Service Project No. CWS-2; OSRD No. 3437. Johns Hopkins University. April 4, 1944.
- M18** Study of dissociation of bound H produced by oxidative conditions compatible with cell life. (Report No. 28.) W. Morton Grant and V. Everett Kinsey. OEMcmr-141. Harvard University, Medical School. April 5, 1944.
- M19** Protective and therapeutic agents for war gases. Preparation of new antidotes. (Progress Report to June 15, 1943.) Paul L. Salzberg, W. A. Lazier and others. OEMsr-377; Service Project No. CWS-4; OSRD No. 4460. E. I. duPont de Nemours and Company, Inc. December 14, 1944.
- M20** The development of methods for testing the abilities of agents to combat the effects of mustard gas, H, and other vesicants upon the skin. (Progress Report to February, 1945.) Philip D. McMaster, George H. Hogeboom and others. OEMsr-434; Service Project No. CWS-2; OSRD No. 4853. Rockefeller Institute for Medical Research. March 24, 1945.
- M21** A search for decontaminating and treatment agents for skin exposed to mustard gas, H. (Progress Report to March, 1945.) Philip D. McMaster, George H. Hogeboom and others. OEMsr-434; Service Project No. CWS-2; OSRD No. 4854. Rockefeller Institute for Medical Research. March 24, 1945.
- 522.2 Nitrogen Mustards**
- M1** The protective effect of various ointments against the systemic toxicity of cutaneously applied TL-145. Alfred Gilman, Louis Goodman and others. OEMcmr-51. [Yale University.] June 14, 1943.
- M2** Studies of the action of HMT on TL-146 in vivo. Harry M. Vars, Samuel Gurin and others. OEMcmr-108. University of Pennsylvania. September 20, 1943.
- M3** Prophylactic treatment of HN-2 poisoning in rats by intubation with solutions of HMT. (Report No. A-9.) Harry M. Vars. OEMcmr-108. University of Pennsylvania. January 15, 1944.
- M4** Treatment of HN-1, HN-2, HN-3 and TL-481 ocular injuries with sodium diethyl dithiocarbamate, 4-amino-5-mercapto benzoic acid and 4-amino-5-mercapto benzoic acid ethyl ester. (Report No. 52.) A. E. Maumenee. OEMcmr-24. Wilmer Institute. April 27, 1944.
- M5** Influence of local penicillin on experimental ocular lesions due to HN-1 and HN-3. (Report No. 38.) Francis Heed Adler and Irving H. Leopold. OEMcmr-9. University of Pennsylvania. August 1, 1944.
- M6** Treatment of HN-2, HN-1, HN-3 and L injuries of the rabbit's eye with carbowax ointments containing NDR-602, NDR-620 or BAL; or mixtures of NDR-602 + BAL. (Report No. 59.) Jonas

S. Friedenwald and William F. Hughes, Jr.
OEMcmr-24. Wilmer Institute. August 12, 1944.

522.21 Compounds 1070 and 1130

- M1** Pharmacodynamics of [Compound] 1130 and its transformation products, and the antidotal value of sodium thiosulfate. Alfred Gilman, Louis Goodman and Frederick S. Phillips. OEMcmr-51. [Yale University.] October 1, 1942.
- M2** Reactions of [Compounds] 1070 and 1130 with chloroamides. (Progress Report to December 1, 1942.) Homer Adkins. OEMsr-304; Service Project Nos. CWS-24 and NL-B27; OSRD No. 1289. University of Wisconsin. March 23, 1943.

523 Lewisite

- M1** Hemolytic effects of organic and inorganic arsenic compounds. (Monthly Progress Report No. 10.) Cornelius P. Rhoads. [OEMcmr-96.] [Memorial Hospital for the Treatment of Cancer and Allied Diseases.] January 31, 1943.
- M2** Tests for decontamination of lewisite on human skin. (Progress Report to March, 1944.) John F. Thomson, Eugene Goldwasser and Joseph Savit. OEMcmr-52 and NDCrc-132; Service Project No. CWS-2; OSRD No. 3501. CMR Committee on the Treatment of Gas Casualties and University of Chicago. April 18, 1944.

523.1 Lewisite and Mustard Gas Mixtures

- M1** Orientation experiments on rabbits and human beings in decontamination and in protection against both liquid mustard and liquid lewisite. (n.a.) OEMcmr-103. Cornell University, Medical College. March 29, 1943.
- M2** The decontamination of skin sites exposed to mixtures of liquid mustard gas and lewisite. (Report No. B-17.) Marion B. Sulzberger, Rudolf L. Baer and Abram Kanof. OEMcmr-103. Cornell University, Medical College. March 31, 1944.

524 Phosgene and Diphosgene

- M1** Oxygen in the treatment of phosgene poisoning. Additional note on the infusion of small amounts of plasma. (Report No. III.) Henry Bunting, Harold E. Harrison and others. OEMcmr-39. Yale University. June 1, 1943.
- M2** Pitressin and dehydration in the treatment of diphosgene poisoning. (Report No. 11.) R. W. Gerard, J. Tobias and others. OEMcmr-114. University of Chicago. January 12, 1944.

525 Compound W

- M1** Immunochemical studies. (Informal Monthly Progress Report Nos. 1 to 21.) Michael Heidelberger and Elvin A. Kabat. OEMsr-901; Service Project No. CWS-2. [Columbia University.] March 10, 1943 to November 30, 1944.
- M2** Immunochemical aspects of protection against [Compound] W poisoning. Minutes of meeting

held at Dumbarton Oaks . . . Washington, D. C. on January 18, 1944. Birdsey Renshaw. [January, 1944.]

- M3** Notes on conference on [Compound] W serology [at] Dumbarton Oaks, June 10, 1944. Birdsey Renshaw. [June, 1944.]
- M4** Immunochemical studies on [Compound] W. (Final Report to December 15, 1944 and Supplement [to] July 1, 1945.) Michael Heidelberger and Elvin A. Kabat. OEMsr-901 and OEMcmr-507; Service Project No. CWS-2; OSRD No. 4651. Columbia University and Neurological Institute of New York. February 2 and July 1, 1945.
- M5** Immunochemical studies. (Informal Monthly Progress Report Nos. CMR-1 and -2.) Michael Heidelberger, Elvin A. Kabat and others. OEMcmr-507. [Columbia University.] April 1 and June 1, 1945.

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Miscellaneous Agents

- M1** Studies on AF-1, PF-3 and BAL. (Progress Report No. 14.) McKeen Cattell. OEMcmr-245. Cornell University, Medical College. July 31, 1944.
- M2** Methyl fluoracetate. PF-3 in myasthenia gravis. (Bi-monthly Progress Report No. 22-A.) McKeen Cattell. OEMcmr-245. Cornell University, Medical College. July 30, 1945.

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General Healing Studies

- M1** Promotion of healing in residual lesions after primary treatment of tissues exposed to vesicant gases. (Monthly progress report.) Samuel C. Harvey. OEMcmr-83. [Yale University.] June 29, 1942.
- M2** [Observations on the course of healing of a defect in the skin produced by surgical excision of a circular area. The effect of sulfonamide drugs on *Candida (Monilia) albicans*.] Samuel C. Harvey. OEMcmr-83. [Yale University.] September 1, 1942.
- M3** Promotion of healing in residual lesions after primary treatment of tissues exposed to vesicant gases. (Monthly Progress Report No. 8.) Samuel C. Harvey, Kenneth W. Thompson and Gervase J. Connor. OEMcmr-83. [Yale University.] February 1, 1943.
- M4** [Experiments with the buried-strip method of studying wound healing.] Samuel C. Harvey. OEMcmr-83. [Yale University.] April 10, 1943.
- M5** Promotion of healing in residual lesions after primary treatment of tissues exposed to vesicant gases. (Annual report.) Samuel C. Harvey. OEMcmr-83. Yale University. July 1, 1943.

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Protective Clothing

- M1** Protective cloths. [Part] I, Irritancy of vapor-contaminated samples on human skin. [Part] II, Penetration of vapor and liquid vesicants. (Progress Report to June 30, 1944.) Joseph Savit, Eugene Goldwasser and others. NDCrc-132; Service Project No. CWS-2; OSRD No. 3942. University of Chicago. August 30, 1944.

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- M2** Permeable protective fabrics. (Part LXX. Final Report to October 1, 1945.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 6378. E. I. duPont de Nemours and Company, Inc. December 20, 1945.

541 Impregnants

- M1** Permeable protective fabrics. (Part LVI, Evaluation of new impregnates. (Progress Report to January 19, 1943.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 5555. E. I. duPont de Nemours and Company, Inc. September 10, 1945.

541.1 Carbon Impregnants (CC-2)

- M1** Permeable protective fabrics. Thermal decomposition of CC-2. (Progress Report to July 6, 1943.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 3151. E. I. duPont de Nemours and Company, Inc. January 13, 1944.
- M2** Permeable protective fabrics. (Part XIII, Development of pre-ground, dry CC-2. (Progress Report to April 1, 1943.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 4427. E. I. duPont de Nemours and Company, Inc. December 4, 1944.
- M3** Permeable protective fabrics. (Part LXVI, Storage of pre-ground, dry CC-2. (Progress Report to August 31, 1945.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 6196. E. I. duPont de Nemours and Company, Inc. December 14, 1945.

541.11 Development of Carbon-Coated Fabrics

- M1** Informal report with regard to estimated cost of carbon-coated fabrics. George E. Sinkinson. OEMsr-935. Sayles Finishing Plants, Inc. November 2, 1944.
- M2** Development of cloth impregnated with activated carbon. (Informal Monthly Report covering the period from December 10, 1944 to January 11, 1945.) Robert H. Gillespie. OEMsr-779. Kendall Company. January 11, 1945.
- M3** Development of plant procedure for preparation of carbon-impregnated fabrics. (Final Report to June 30, 1945.) W. P. Hall. OEMsr-884; Service Project Nos. CWS-24 and NL-B27; OSRD No. 5419. Joseph Bancroft and Sons Company. August 7, 1945.
- M4** Development of gas-protective rayon yarns and fabrics. (Final Report to May 1, 1943.) Joseph L. Costa and R. A. Morse. OEMsr-720; Service Project Nos. CWS-24 and NL-B27; OSRD No. 5934. Manville-Jenckes Corporation. September 26, 1945.
- M5** Rayon containing activated carbon for use in protective clothing. (Final Report to October 31, 1945.) S. A. Moss, Jr. OEMsr-1327; Service Project Nos. CWS-24 and NL-B27; OSRD No. 6287.

American Viscose Corporation. November 19, 1945.

- M6** Permeable protective fabrics. (Part LXIII, Carbon impregnations from organic solvent suspension. (Progress Report to September 1, 1945.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 6193. E. I. duPont de Nemours and Company, Inc. December 12, 1945.

- M7** Preparation of carbon-coated protective fabrics. (Joint Final Report to October 31, 1945.) Dana Burks, Jr., George E. Sinkinson and others. OEMsr-779 and OEMsr-935; Service Project Nos. CWS-24 and NL-B27; OSRD No. 6272. Kendall Company and Sayles Finishing Plants, Inc. February 14, 1946.

541.111 Dispersing and Binding Agents

- M1** Permeable protective fabrics. (Part VIII, Survey of aqueous emulsifying-dispersing agents. (Progress Report to December 31, 1943.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 3988. E. I. duPont de Nemours and Company, Inc. August 1, 1944.

- M2** Permeable protective fabrics. (Part X, Methylcellulose as the emulsifying-dispersing agent for the T of O process of impregnation. (Progress Report to August 14, 1943.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 3998. E. I. duPont de Nemours and Company, Inc. August 9, 1944.

- M3** Permeable protective fabrics. (Part XXVII, Camouflage pigmentation. (Progress Report to February 1, 1944.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 4759. E. I. duPont de Nemours and Company, Inc. March 1, 1945.

- M4** Permeable protective fabrics. (Parts XXXII and XXXIII, Substitutes for chloroparaffin. (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD Nos. 4910 and 4922. E. I. duPont de Nemours and Company, Inc. April 7 and 10, 1945.

- M5** The impregnation of fabrics with activated carbon. (Final Report to January 1, 1945.) W. J. Thackston, S. N. Glarum and R. O. Steele. OEMsr-575; Service Project Nos. CWS-24 and NL-B27; OSRD No. 4919. Rohm and Haas Company. April 9, 1945.

- M6** Permeable protective fabrics. (Parts XXXV and XXXVII, Reimpregnation studies. (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD Nos. 4941 and 5072. E. I. duPont de Nemours and Company, Inc. April 14, and May 18, 1945.

- M7** Permeable protective fabrics. (Part XXXVI, Washfastness of CC-2 impregnated from aqueous dispersions. (Progress Report to November 1, 1943.) (n.a.) OEMsr-361; Service Project Nos. CWS-24

and NL-B27; OSRD No. 5081. E. I. duPont de Nemours and Company, Inc. May 17, 1945.

- M8** Permeable protective fabrics. [Part] XLVI, Survey of aqueous emulsifying-dispersing agents. (Progress Report to June 1, 1945.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 5427. E. I. duPont de Nemours and Company, Inc. August 9, 1945.
- M9** Permeable protective fabrics. [Part] LXII, Carbon impregnations from water suspension. (Progress Report to September 1, 1945.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 6192. E. I. duPont de Nemours and Company, Inc. December 12, 1945.

541.112 Fabric Effect on Aging

- M1** Permeable protective fabrics. [Part] XVII, Effect of fabric on aging stability. (Quartermaster Series Report to September 17, 1943.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 4599. E. I. duPont de Nemours and Company, Inc. January 18, 1945.
- M2** Permeable protective fabrics. [Part] XVIII, Effect of fabric on aging stability of impregnated fabrics. (Second Quartermaster Series Report, to June 1, 1944.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 4603. E. I. duPont de Nemours and Company, Inc. January 19, 1945.
- M3** Studies of carbon-coated and carbon-impregnated fabrics. Laundering procedures. Wearing trials. (Progress Report to October 1, 1944.) S. N. Glarum and R. O. Steele. OEMsr-559; Service Project Nos. CWS-24 and NL-B27; OSRD No. 5502. Rohm and Haas Company. August 28, 1945.
- M4** Permeable protective fabrics. [Part] LXVII, Effect of fabric on aging quality of stabilized impregnated fabrics. (Progress Report to January 8, 1945.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 6197. E. I. duPont de Nemours and Company, Inc. December 17, 1945.

541.113 CC-2 Retention Through Wear

- M1** Permeable protective fabrics. [Part] XIV, Stabilization of CC-2 impregnated fabrics. Search for agents alternative to zinc oxide. (Progress Report to November 1, 1943.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 4583. E. I. duPont de Nemours and Company, Inc. January 15, 1945.
- M2** Permeable protective fabrics. [Part] XX, CC-2, stability tests on clothing in Panama troop wearing trial. (Progress Report to November 17, 1944.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 4618. E. I. duPont de Nemours and Company, Inc. January 22, 1945.
- M3** Permeable protective fabrics. [Part] XXXIV, Stabilizers for CC-2. (Progress Report to November 1,

1943.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 4936. E. I. duPont de Nemours and Company, Inc. April 13, 1945.

- M4** Permeable protective fabrics. [Part] XLVIII, CC-2 [and] S-461. Fabric stabilization [and] effect of pre-treatment on stability of impregnated fabrics. (Progress Report to February 1, 1944.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 5431. E. I. duPont de Nemours and Company, Inc. August 10, 1945.
- M5** Permeable protective fabrics. [Part] LIX, CC-2 retention of impregnated fabric during wear. (Progress Report to May 25, 1945.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 6089. E. I. duPont de Nemours and Company, Inc. October 17, 1945.
- M6** Permeable protective fabrics. [Part] LX, Stabilization of fabric with calcium carbonate. (Progress Report to May 25, 1945.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 6090. E. I. duPont de Nemours and Company, Inc. October 18, 1945.
- M7** Permeable protective fabrics. [Part] LXIV, CC-2 retention of impregnated fabric during wear. (Progress Report to August 25, 1945.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 6194. E. I. duPont de Nemours and Company, Inc. December 12, 1945.
- M8** Permeable protective fabrics. [Part] LXV, Second Quartermaster Series. (Progress Report to September 15, 1945.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 6195. E. I. duPont de Nemours and Company, Inc. December 14, 1945.

541.12 Evaluation of CC-2

- M1** The evaluation of protective fabrics against mustard. (Informal Monthly Progress Report covering [the] period from September 10 to October 10, 1944.) Homer Adkins, A. L. Wilds and others. OEMsr-304. [University of Wisconsin,] October 10, 1944.

541.13 Skin Irritation

- M1** Permeable protective fabrics. [Part] XXI, Skin irritation. (Progress Report to September 15, 1943.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 4624. E. I. duPont de Nemours and Company, Inc. January 23, 1945.
- M2** Permeable protective fabrics. [Part] LVIII, Skin irritation [in] 1944 Edgewood Arsenal wearing tests. (Progress Report to October 1, 1944.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 6068. E. I. duPont de Nemours and Company, Inc. October 10, 1945.

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541.2 Chloroamides as Impregnants

(See also: 511)

541.21 Preparation of Chloroamides

M1 The preparation of dimethylglycoluril. (Final Report to May 26, 1943.) W. Allan Fisher. OEMsr-869; Service Project Nos. CWS-24 and NL-B27; OSRD No. 3358. Allied Chemical and Dye Corporation. March 14, 1944.

M2 The preparation of S-436 and other chloroamides. (Progress Report to April, 1945.) Homer Adkins, John E. Castle and others. OEMsr-304; Service Project Nos. CWS-24 and NL-B27; OSRD No. 5384. University of Wisconsin. May 5, 1945.

M3 Permeable protective fabrics. [Part] XLVII, S-461 powder, control of thermal propagation. (Progress Report to August 2, 1943.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 5429. E. I. duPont de Nemours and Company, Inc. August 9, 1945.

541.22 Evaluation and Stabilization of Chloroamides

M1 Stabilization of impregnated fabrics. (Progress Report No. 273, to June 17, 1942.) (n.a.) OEMsr-361; Service Project Nos. NL-B27 and CWS-24; OSRD No. 638. E. I. duPont de Nemours and Company, Inc. June 22, 1942.

M2 The relative effectiveness of chloroamides against certain toxic agents. (Progress Report to July 7, 1942.) Homer Adkins. OEMsr-304; Service Project Nos. CWS-24 and NL-B27; OSRD No. 794. University of Wisconsin. August 3, 1942.

M3 Quantitative determination of antivesicants in cloths. (Final Report No. 413, to August 20, 1942.) Arthur M. Buswell. OEMsr-276; Service Project No. NL-B25; OSRD No. 990. University of Illinois. November 2, 1942.

M4 Comparison of impregnates against mustard. (Progress Report No. 428, to October 22, 1942.) Homer Adkins. OEMsr-304; Service Project Nos. CWS-24 and NL-B27; OSRD No. 1010. University of Wisconsin. November 14, 1942.

M5 Products of the decontamination of mustard by cloth impregnated with S-461. (Progress Report to March 31, 1943.) Homer Adkins. OEMsr-304; Service Project Nos. NL-B31, NL-B27 and CWS-24; OSRD No. 1760. University of Wisconsin. September 1, 1943.

M6 Comparison of chloroamides as impregnants against [Compound] 1149. (Progress Report to March 31, 1943.) Homer Adkins. OEMsr-304; Service Project Nos. CWS-24 and NL-B31; OSRD No. 1762. University of Wisconsin. September 1, 1943.

M7 Permeable protective fabrics. [Part] XVI, Development of evaluation tests [for] aging properties. (Progress Report to September 25, 1943.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 4592. E. I. duPont de Nemours and Company, Inc. January 17, 1945.

M8 Permeable protective fabrics. [Part] XLV, Stabili-

zation and evaluation of S-461 impregnated fabrics. (Progress Report to December 1, 1943.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 5421. E. I. duPont de Nemours and Company, Inc. August 8, 1945.

M9 Permeable protective fabrics. [Parts] LIV and LV, Investigation of new chloroamides. (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD Nos. 5534 and 5554. E. I. duPont de Nemours and Company, Inc. September 5 and 7, 1945.

541.23 Solvents for Chloroamides

M1 The solubilities of impregnates in various solvents. (Final Report No. 368, to August 24, 1942.) Lee Irvin Smith. OEMsr-372; Service Project Nos. NL-B27 and CWS-24; OSRD No. 912. University of Minnesota. September 22, 1942.

542 Impregnation in the Field

M1 Permeable protective fabrics. [Part] V, Field method of impregnation with CC-2 and S-461. Status following field trials. (Progress Report to February 28, 1943.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 3362. E. I. duPont de Nemours and Company, Inc. March 15, 1944.

M2 Permeable protective fabrics. [Part] VI, Development of standard CC-2 field impregnation system. (Progress Report to October 20, 1943.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 3389. E. I. duPont de Nemours and Company, Inc. March 23, 1944.

M3 Permeable protective fabrics. [Part] XIX, Simplified field impregnation systems, CC-2. Exploratory studies. (Progress Report to December 31, 1943.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 4610. E. I. duPont de Nemours and Company, Inc. January 20, 1945.

M4 Permeable protective fabrics. [Part] LIII, CC-2 [and] S-461 emergency impregnation systems for tropical shorts only. (Progress Report to December 1, 1943.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 5526. E. I. duPont de Nemours and Company, Inc. September 4, 1945.

542.1 Impregnating Sets

M1 Permeable protective fabrics. [Part] XI, Storage tests on the field impregnating set, M-1. (Progress Report to March 25, 1944.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 4002. E. I. duPont de Nemours and Company, Inc. August 10, 1944.

M2 Permeable protective fabrics. [Part] LXI, Development of helmet impregnating set. (Progress Report to August 25, 1945.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 6191. E. I. duPont de Nemours and Company, Inc. December 11, 1945.

- M3** Permeable protective fabrics. [Part] LXVIII, Development of light-weight field impregnating sets. (Progress Report to August 25, 1945.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 6198. E. I. duPont de Nemours and Company, Inc. December 17, 1945.
- M4** Permeable protective fabrics. [Part] LXIX, Field impregnating set, M-1, storage tests. . . . (Progress Report to July 1, 1945.) (n.a.) OEMsr-361; Service Project Nos. CWS-24 and NL-B27; OSRD No. 6199. E. I. duPont de Nemours and Company, Inc. December 17, 1945.
- 543 Testing of Impregnated Fabrics**
- 543.1 Thermometric Method**
- M1** A thermometric method for the determination of the amount of impregnate in cloth. (Progress Report No. 346, to August 5, 1942.) Warren C. Johnson. OEMsr-87; Service Project No. NL-B25; OSRD No. 848. University of Chicago. August 31, 1942.
- M2** A thermometric instrument for the determination of the amount of impregnate in cloth. (Final Report to March, 1944.) George A. Perley. OEMsr-714; Service Project No. NL-B25; OSRD No. 3622. Leeds and Northrup Company, Inc. May 11, 1944.
- 543.2 Against Mustard (H)**
- M1** Testing impregnated cloth with a hot filament tester. (Informal Report No. 41.) Henry E. Bent. [OEMsr-312.] University of Missouri. May 5, 1942.
- M2** The NDRC method for laboratory evaluation of permeable protective fabrics against mustard. (Progress Report to September 1, 1945.) Willa I. Guss and Homer Adkins. OEMsr-304; Service Project Nos. CWS-24 and NL-B27; OSRD No. 6084. University of Wisconsin. October 17, 1945.
- M3** Correlation of standard Chemical Warfare Service test data with NDRC titrimeter data. (Progress Report to June 30, 1945.) Loren C. Hurd, O. B. Hager and others. OEMsr-559; Service Project Nos. CWS-24 and NL-B27; OSRD No. 6412. Rohm and Haas Company. December 21, 1945.
- M4** Test methods used for the evaluation of protective fabrics against vesicant gases at the Rohm and Haas Laboratories. (Final Report to June 30, 1945.) Loren C. Hurd, O. B. Hager and others. OEMsr-559; Service Project Nos. CWS-24 and NL-B27; OSRD No. 6347. Rohm and Haas Company. January 4, 1946.
- 550 Gas Masks**
- M1** The value of soda lime in gas absorbents. (Progress Report No. 198.) W. Conway Pierce, Edwin O. Wiig and others. NDCrc-76, NDCrc-122 and others; Service Project No. CWS-7; OSRD No. 437. Northwestern University, University of Rochester and others. March 6, 1942.
- M2** Comparative retentivities of whetlerite and Type D mixture for SeF_6 and for [Compound] 1120. (Progress Report No. 262.) Roscoe G. Dickinson, John W. Otvos and Arthur J. Stosick. NDCrc-137; Service Project No. CWS-7; OSRD No. 616. California Institute of Technology. May 9, 1942.
- 560 Decontamination of:**
- 561 Water Supplies**
- M1** Analysis and treatment of water. (Final Report No. 387, to August 31, 1942.) Arthur M. Buswell. OEMsr-109; Service Project No. CWS-14; OSRD No. 944. University of Illinois. October 9, 1942.
- M2** [Water] detection and decontamination problems. . . . (Informal Monthly Progress Reports [covering the period from] September 10 to October 10, 1943; December 10, 1943 to January 10, 1944 and March 10 to August 10, 1944.) Charles C. Price, G. W. Bennett and others. OEMsr-593. [University of Illinois] and West Virginia Pulp and Paper Company.
- M3** Investigations on evaluation of powdered activated carbons in the removal of Chemical Warfare Service agents from water supplies. (Twelfth Progress Report covering the period [from] February 10 to March 10, 1944.) Matthew M. Braidech, Harry Gilbert and others. OEMsr-910; Research Project No. PDRC-848. Case School of Applied Science. March 14, 1944.
- M4** Treatment of water contaminated with chemical warfare agents. (Progress Report to March 1, 1944.) Arthur M. Buswell, Charles C. Price and others. OEMsr-593; Service Project No. CWS-14; OSRD No. 3621. University of Illinois. May 13, 1944.
- M5** Evaluation of powdered activated carbons for the purification of military water supplies contaminated with chemical warfare agents. (Final Report to June 1, 1944.) Matthew M. Braidech. OEMsr-910; Service Project No. CWS-14; OSRD No. 4301. Case School of Applied Science. November 2, 1944.
- 562 Painted and Plastic Surfaces**
- M1** A study of the decontamination of painted surfaces which have been exposed to chemical warfare agents. Special assignment on estimation of extent of damage which would result from a war-gas attack on factories. (Progress Report to April 1, 1943.) J. E. Kirby, H. S. Rothrock and others. OEMsr-585; Service Project No. NL-B30; OSRD No. 3131. E. I. duPont de Nemours and Company, Inc. January 14, 1944.
- M2** A study of the decontamination of painted surfaces which have been exposed to chemical warfare agents. Special study of the effect of HS and of decontamination treatments on airplane fabrics. (Progress Report to April 1, 1943.) J. E. Kirby, H. S. Rothrock and R. N. MacDonald. OEMsr-585; Service Project No. NL-B30; OSRD No. 3132.

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- E. I. duPont de Nemours and Company, Inc. January 14, 1944.
- M3** The study of the decontamination of painted surfaces which have been exposed to chemical warfare agents. (Progress Report to April 1, 1943.) J. E. Kirby, H. S. Rothrock and others. OEMsr-585; Service Project No. NL-B30; OSRD No. 3133. E. I. duPont de Nemours and Company, Inc. January 14, 1944.
- M4** Decontaminating systems. (Progress Report to March 1, 1944.) J. E. Kirby, H. S. Rothrock and others. OEMsr-585; Service Project No. NL-B30; OSRD No. 3602. E. I. duPont de Nemours and Company, Inc. May 10, 1944.
- M5** Improved decontaminating systems. (Progress Reports to May 1, 1944.) J. E. Kirby, H. S. Rothrock and others. OEMsr-585; Service Project No. NL-B30; OSRD Nos. 3782 and 3927. E. I. duPont de Nemours and Company, Inc. June 10 and August 1, 1944.
- M6** Improved decontaminating systems. Chloroamide/solvent systems. (Progress Report to July 15, 1944.) J. E. Kirby, H. S. Rothrock and A. E. Barkdoll. OEMsr-585; Service Project No. NL-B30; OSRD No. 4518. E. I. duPont de Nemours and Company, Inc. January 1, 1945.
- M7** Improved decontaminating systems. Further development of oleate paste systems. (Progress Report to July 15, 1944.) J. E. Kirby, H. S. Rothrock and R. N. MacDonald. OEMsr-585; Service Project No. NL-B30; OSRD No. 4523. E. I. duPont de Nemours and Company, Inc. January 1, 1945.
- M8** Thickening 40:60 bleach/water slurries by means of asbestos. (Progress Report to January 31, 1945.) J. E. Kirby, H. S. Rothrock and R. N. MacDonald. OEMsr-585; Service Project No. NL-B30; OSRD No. 5025. E. I. duPont de Nemours and Company, Inc. May 2, 1945.
- M9** Decontamination studies. (Final Report to June 30, 1945.) J. E. Kirby, H. S. Rothrock and others. OEMsr-585; Service Project No. NL-B30; OSRD No. 5389. E. I. duPont de Nemours and Company, Inc. August 1, 1945.
- 563 Clothing**
- M1** A study of the decontamination of surfaces which have been exposed to chemical warfare agents. Special study of the decontamination and regeneration of carbon fabrics. (Progress Report to December 31, 1944.) J. E. Kirby, H. S. Rothrock and others. OEMsr-585; Service Project No. NL-B30; OSRD No. 4889. E. I. duPont de Nemours and Company, Inc. April 2, 1945.
- 564 Specific Chemical Warfare Agents**
- M1** Preliminary examination of [Compound] 1120 removal. (Progress Report No. 142.) Roscoe G. Dickinson, Arthur J. Stosick and John W. Otvos. NDCrc-137; Service Project No. CWS-7; OSRD No. 300. California Institute of Technology. December 18, 1941.
- M2** The decontamination of certain chemical warfare agents. (Informal Report No. 6.) Homer Adkins. [OEMsr-304.] University of Wisconsin. May 9, 1942.
- M3** The action of decontaminants on mustard gas. (Progress Report No. 311, to June 5, 1942.) R. C. Fuson and C. S. Marvel. OEMsr-300; Service Project No. NL-B31; OSRD No. 795. University of Illinois. August 7, 1942.
- M4** The chemistry of chloro sulfides and N-chloro compounds. Reactions involved in the decontamination of mustard gas. (Progress Report to October 1, 1943.) Charles D. Hurd. OEMsr-135; Service Project No. NL-B31; OSRD No. 1508. Northwestern University. June 10, 1943.
- 600 ANTIMALARIAL AGENTS AND INTERMEDIATES**
- M1** [The preparation of some antimalarial intermediates.] (Monthly Progress Reports covering the period [from] July 8, 1944 to August 8, 1945.) George H. Coleman, Robert L. Sundberg and others. OEMsr-223. State University of Iowa.
- M2** Preparation of antimalarial intermediates. (Informal Monthly Progress Reports covering the period from August 21, 1944 to August 10, 1945.) Homer Adkins, A. L. Wilds and others. OEMsr-304. [University of Wisconsin.]
- M3** Preparation of antimalarial intermediates. (Informal Monthly Progress Reports covering the period [from] January 10 to June 10, 1945.) Ralph L. Shriner and J. C. Speck, Jr. OEMsr-195. [Indiana University.]
- M4** The synthesis of therapeutic agents and intermediates. (Informal Monthly Progress Reports covering the period from May 10 to August 9, 1945.) R. C. Fuson, Charles C. Price and others. OEMsr-300. [University of Illinois.]
- M5** The synthesis of substituted isoquinolines as antimalarial intermediates. (Final Report to July 20, 1945.) Ralph L. Shriner and J. C. Speck, Jr. OEMsr-195; Service Project No. SG-7; OSRD No. 5468. Indiana University. August 21, 1945.
- M6** Syntheses of benzoquinoline derivatives and certain antimalarial intermediates. (Final Report to August 31, 1945.) Cliff S. Hamilton, R. F. Coles and others. OEMsr-85; Service Project No. SG-7; OSRD No. 6357. University of Nebraska. November 29, 1945.
- M7** Preparation of antimalarial intermediates. (Final Report to September 8, 1945.) George H. Coleman. OEMsr-223; Service Project No. SG-7; OSRD No. 6424. State University of Iowa. December 19, 1945.
- M8** Synthesis of antimalarial intermediates. (Final Report covering the period [from] September 1 to December 31, 1945.) George H. Coleman, Stanley S. Brandt and others. OEMcmr-564. [State University of Iowa.] December 31, 1945.

- M9** Syntheses of benzoquinoline derivatives and certain antimalarial intermediates. (Final report.) Cliff S. Hamilton, R. F. Coles and others. OEMcmr-566. [University of Nebraska,] December 31, 1945.
- M10** Preparation of intermediates and synthesis of potential antimalarials. (Final report.) Charles D. Hurd, Otis E. Fancher and others. OEMcmr-563. [Northwestern University,] January 31, 1946.
- M11** Synthesis of potential antimalarial agents and intermediates. (Final report.) Homer Adkins, Harry P. Schultz and others. OEMcmr-567. University of Wisconsin. February 28, 1946.
- M12** Antimalarial intermediates and drugs. (Final report.) Henry Gilman, R. A. Benkeser and others. [OEMcmr-]M-6383. Iowa State College. March 11, 1946.
- M13** The synthesis of candidate antimalarial drugs and related compounds. (Final report.) R. C. Fuson, Charles C. Price and others. OEMcmr-570. [University of Illinois,] May 31, 1946.

700 INSECT AND RODENT CONTROL

710 Insect Control

- M1** Investigations on the control of insects and other arthropods of importance to the Armed Forces, conducted by the Orlando, Florida, Research Laboratory, April, 1942 to October, 1945. (Section No. 1. Final report.) (n.a.) OEMcmr-M-4331. US Department of Agriculture, Bureau of Entomology and Plant Quarantine. [October (?) 1945.]

711 Insect-Repellents

- M1** Preparation of candidate insect repellents. (Final Report to April 1, 1945.) Lee Irvin Smith, C. F. Koelsch and Vaughn Engelhardt. OEMsr-372; Service Project Nos. SG-6 and CWS-32; OSRD No. 5285. University of Minnesota. June 30, 1945.
- M2** The synthesis of some compounds for testing as insect repellents. (Progress Report to September 30, 1945.) C. D. Heaton, L. Kaplan and Carl R. Noller. OEMsr-136; Service Project Nos. CWS-32 and SG-6; OSRD No. 6368. Stanford University. December 3, 1945.
- M3** The preparation of some compounds for testing as insect repellents. (Final Report to October 31, 1945.) Nathan L. Drake, Charles M. Eaker and others. OEMsr-1303; Service Project Nos. CWS-32 and SG-6; OSRD No. 6370. University of Maryland. December 14, 1945.
- M4** The preparation of some organic compounds for testing as insect repellents. (Final Report to October 31, 1945.) Paul D. Bartlett, Hyp J. Dauben, Jr. and others. NDCrc-136; Service Project Nos. CWS-32 and SG-6; OSRD No. 6367. Harvard University. December 17, 1945.
- M5** The preparation of some compounds for testing as insect repellents. (Final Report to October 31,

1945.) Melvin S. Newman, Barney Magerlein and others. OEMsr-1307; Service Project Nos. CWS-32 and SG-6; OSRD No. 6369. Ohio State University. December 28, 1945.

- M6** Some compounds submitted for testing as insect repellents. (Report to September 30, 1945.) Homer Adkins, Arthur C. Cope and others. Service Project Nos. CWS-32 and SG-6; OSRD No. 6371. February 26, 1946.

712 Insecticides

712.1 DDT

712.11 Analysis

- M1** The composition of a sample of technical DDT from the DuPont Company, (Final Report to November 9, 1944.) Paul D. Bartlett, George P. Mueller and Abraham Schneider. OEMsr-1304; Service Project No. SG-6; OSRD No. 4701. Harvard University. February 15, 1945.
- M2** The composition of DDT by-product oils from Hercules Powder Company. (Progress Report to November 15, 1945.) Melvin S. Newman, Barney Magerlein and William Wheatley. OEMsr-1307; Service Project No. SG-6; OSRD No. 4703. Ohio State University. February 15, 1945.
- M3** The composition of a sample of technical DDT from Merck and Company, Inc. (Progress Report to December 15, 1944.) Nathan L. Drake, Glen W. Kilmer and Charles M. Eaker. OEMsr-1303; Service Project No. SG-6; OSRD No. 4702. University of Maryland. February 15, 1945.
- M4** Ultraviolet absorption studies on DDT. (Progress Report to March 1, 1945.) Weldon G. Brown and Edith M. Boldebuck. OEMsr-79; Service Project Nos. SG-6 and CWS-32; OSRD No. 4782. University of Chicago. March 6, 1945.
- M5** Ultraviolet absorption spectra of compounds related to DDT. (Progress Report to July 19, 1945.) Edith M. Boldebuck and Weldon G. Brown. OEMsr-79; Service Project Nos. SG-6 and CWS-32; OSRD No. 5390. University of Chicago. July 27, 1945.
- M6** Investigations on the control of insects and other arthropods of importance to the Armed Forces, conducted by Division of Insecticide Investigations, Beltsville, Maryland. (Section 2. Final Report [covering the period from] May, 1944 to October 31, 1945.) (n.a.) OEMcmr-M-4331. US Department of Agriculture, Bureau of Entomology and Plant Quarantine. October 31, 1945.
- M7** DDT formulations. Applications of infrared spectroscopy to DDT. (Progress Report to October 31, 1945.) Paul L. Salzberg, G. D. Patterson and others. OEMsr-1362; Service Project Nos. CWS-32 and SG-6; OSRD No. 6337. E. I. duPont de Nemours and Company, Inc. January 24, 1946.

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712.12 Vehicles

- M1** DDT formulations. Spreading agents for larvicidal oils on water. (Progress Report to February 1, 1945.) Paul L. Salzberg, G. D. Patterson and others. OEMsr-1362; Service Project Nos. CWS-32 and SG-6; OSRD No. 6208. E. I. duPont de Nemours and Company, Inc. October 23, 1945.
- M2** DDT formulations. Solvents of high solution capacity. (Progress Report to August 1, 1945.) Paul L. Salzberg, G. D. Patterson and W. V. Freed. OEMsr-1362; Service Project Nos. CWS-32 and SG-6; OSRD No. 6226. E. I. duPont de Nemours and Company, Inc. November 28, 1945.
- M3** DDT formulations. Surface-active agents for emulsifiable DDT concentrates. (Progress Report to February 1, 1945.) Paul L. Salzberg, G. D. Patterson and W. V. Freed. OEMsr-1362; Service Project Nos. CWS-32 and SG-6; OSRD No. 6336. E. I. duPont de Nemours and Company, Inc. November 29, 1945.
- M4** DDT formulations. Water-dispersible pastes. (Progress Report to January 31, 1945.) Paul L. Salzberg, G. D. Patterson and I. F. Walker. OEMsr-1362; Service Project Nos. CWS-32 and SG-6; OSRD No. 6335. E. I. duPont de Nemours and Company, Inc. January 11, 1946.
- M5** DDT formulations. Water-dispersible powders. (Progress Report to October 31, 1945.) Paul L. Salzberg, G. D. Patterson and I. F. Walker. OEMsr-1362; Service Project Nos. CWS-32 and SG-6; OSRD No. 6334. E. I. duPont de Nemours and Company, Inc. February 20, 1946.

712.13 Detection

- M1** Detection for DDT. Henry E. Bent. OEMsr-312. University of Missouri. January 5, 1945.
- M2** [Determination of DDT.] (Informal Monthly Progress Report covering the period [from] December 11, 1944 to January 10, 1945.) Henry E. Bent and Lloyd B. Thomas. OEMsr-312. University of Missouri. January 10, 1945.
- M3** DDT work. [Detection.] (Part II. Informal Progress Reports for the periods [from] February 11 to March 10, 1945 and April 11 to May 10, 1945.) Edith Boldebeck and Edward G. Ballweber. OEMsr-79. University of Chicago.
- M4** Estimation of small quantities of DDT by the phosgene method. (Progress Report to September, 1945.) Weldon G. Brown, Kenneth E. Wilzbach and Edward G. Ballweber. OEMsr-79; Service Project Nos. CWS-32 and SG-6; OSRD No. 6061. University of Chicago. October 6, 1945.

712.2 Miscellaneous Insecticide Research

- M1** Toxicity of insect repellents and lousicides. (Final report.) Herbert O. Calvery, John H. Draize and others. [OEMcmr-]M-2766 and [OEMcmr-]M-4328. Food and Drug Administration. October 31, 1945.
- M2** Emulsifiable concentrates for fly and odor control. (Progress Report to August 1, 1945.) Paul L. Salzberg, G. D. Patterson and others. OEMsr-

1362; Service Project Nos. CWS-32 and SG-6; OSRD No. 6339. E. I. duPont de Nemours and Company, Inc. December 17, 1945.

713**Insect-Resistant Fabrics**

- M1** Letter to Dr. Wilkins Reeve. Subject: [Constructing a mosquito-resistant fabric.] R. Bouvet. American Viscose Corporation. August 4, 1944.
- M2** Miticides. Fixation on cotton fabric. (Progress Report to August 15, 1945.) Paul L. Salzberg, G. D. Patterson and others. OEMsr-1362; Service Project Nos. CWS-32 and SG-6; OSRD No. 6338. E. I. duPont de Nemours and Company, Inc. January 29, 1946.

720**Rodent Control****721****Rodenticides**

- M1** Animal poisons. Birdsey Renshaw. December 30, 1943.
- M2** Recent work on ANTU and other poisons. (Interim Report No. 78.) Curt P. Richter. OEMcmr-59. [Johns Hopkins University.] May 18, 1945.
- M3** An investigation of procedures of possible value for the chemical estimation of the toxic principle of red squill. (Final Report to September 30, 1945.) L. Kaplan, C. D. Heaton and Carl R. Noller. OEMsr-136; Service Project No. CWS-32; OSRD No. 6433. Stanford University. December 29, 1945.

721.1**Compound 1080**

- M1** Preparation of sodium fluoroacetate, Compound 1080. (Progress Report to September 30, 1945.) W. B. Reed. OEMsr-845; Service Project Nos. CWS-4, CWS-32 and SG-6; OSRD No. 6054. Monsanto Chemical Company. October 15, 1945.
- M2** A summary of field reports on [Compound] 1080, sodium fluoroacetate. (Report No. 163.) Richard A. Ormsbee. National Research Council. December 17, 1945.

800**MISCELLANEOUS RESEARCH****810****Lubrication Studies**

- M1** The preparation of various organic compounds for a study of thin films, especially for lubrication problems. (Progress Report No. 3.) Roger Adams, Homer Adkins and C. S. Marvel. OSRD No. 66. [University of Wisconsin and University of Illinois.] January 17, 1941.
- M2** Preparation of certain organic compounds for the Naval Research Laboratory. (Final Report No. 89.) Carl R. Noller. NDCrc-10; Service Project No. DNRL-8; OSRD No. 151. Stanford University. October 17, 1941.
- M3** The synthesis of hydrocarbons. (Final Report No. 101, to September 15, 1941.) Lee Irvin Smith. NDCrc-17; Service Project No. DNRL-7; OSRD No. 163. University of Minnesota. October 29, 1941.

- M4** Preparation of compounds requested by the Naval Research Laboratory. (Final Report No. 129, to September 15, 1941.) Roger Adams and C. S. Marvel. NDCrc-48; Service Project Nos. NL-B7 and NL-B8; OSRD No. 186. University of Illinois. December 4, 1941.
- M5** The preparation of some high molecular-weight esters. (Progress Report No. 299, to April 15, 1942.) Roger Adams, C. S. Marvel and M. L. Wolfrom. NDCrc-48, OEMsr-48 and OEMsr-161; Service Project Nos. CWS-4 and NL-B7; OSRD No. 752. University of Illinois and Ohio State University. July 20, 1942.
- 820 Microscopical Identification of Explosives**
- M1** Microscopical identification of explosives. (Progress Report to March 1, 1944.) Clyde W. Mason. OEMsr-842; Service Project No. CWS-6; OSRD No. 3658. Cornell University. May 22, 1944.
- 830 Propulsion**
- 831 Propulsion Fuels**
- M1** Preparation of [thirteen] compounds [consisting of alcohols, acids and hydrocarbons] requested by the Naval Research Laboratory. (Final Report No. 95.) Homer Adkins. NDCrc-6; Service Project Nos. DNRL-7 and DNRL-8; OSRD No. 157. University of Wisconsin. October 20, 1941.
- M2** Fuels for propulsion devices. The synthesis of gas-generating compounds. (Progress Report to March 1, 1945.) P. R. Austin, C. J. Mighton and others. OEMsr-1359; Service Project No. NA-174; OSRD No. 4857. E. I. duPont de Nemours and Company, Inc. March 26, 1945.
- M3** Special fuels for propulsion. Evaluation of candidates. (Progress Report to March 1, 1945.) P. R. Austin, C. J. Mighton and others. OEMsr-1359; Service Project No. NA-174; OSRD No. 4886. E. I. duPont de Nemours and Company, Inc. April 2, 1945.
- M4** Special fuels for propulsion. (Progress reports.) P. R. Austin, C. J. Mighton and others. OEMsr-1359; Service Project No. NA-174; OSRD Nos. 5922, 5923 and 5924. E. I. duPont de Nemours and Company, Inc. October 1, 2 and 25, 1945.
- M5** Special fuels for propulsion. (Final Report to September 30, 1945.) P. R. Austin, C. J. Mighton and others. OEMsr-1359; Service Project No. NA-174; OSRD No. 6207. E. I. duPont de Nemours and Company, Inc. November 1, 1945.
- M6** Thermochemical measurements on propulsion fuels. (Final Report to September 30, 1945.) Gebhard Stegeman. OEMsr-1464; Service Project No. NA-174; OSRD No. 6219. University of Pittsburgh. November 10, 1945.
- 832 Hydropulse Motor**
- M1** The hydropulse motor. Neil P. Bailey and H. A. Wilson. OEMsr-1443. Rensselaer Polytechnic Institute. June, 1945.
- M2** Theoretical studies concerning the hydropulse. Ideal mechanical performance characteristics. (AMP Report No. 137.1R.) Edited by: James J. Stoker. OEMsr-945; Service Project No. NA-195. AMG-New York University. July, 1945.



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List of Microfilmed Reports

- 100 SUMMARY REPORTS FOR DIVISION 10**
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- M1** [Progress report for Division 10.] ([Informal Report No. I.] (n.a.) [1941(?).])
- M2** Summary of the work on Division 10 projects during the period from November 16, 1942 to December 15, 1942. W. Conway Pierce, W. H. Rodebush and others. OSRD No. 1169. January 1, 1943.
- M3** Monthly summary report of Projects 10.1 and 10.4, Division 10, NDRC, for the period of June 15 to July 15, 1943. (n.a.) [July, 1943.]
- M4** Division 10 meeting, Dumbarton Oaks, D. C., October 26 and 27, 1943. (n.a.) [October, 1943.]
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- M6** Division 10 meeting, Edgewood Arsenal, June 14, 1944. (n.a.) [June, 1944.]
- M7** Monthly summary reports of Section 10.1 of Division 10, NDRC. (n.a.) February 15 and March 15, 1945.
- M8** Final report on Contract OEMsr-282. Francis E. Blacet. OEMsr-282; Service Project Nos. CWS-1, CWS-7 and others; OSRD No. 5563. Northwestern Technological Institute. September 7, 1945.
- 102 Foreign**
- M1** Report on trip to England, June, 1941. ([Informal Report No. VI.] W. Albert Noyes, Jr. [June, 1941.]
- M2** Summary of English report. ([Informal Report No. II.] (n.a.) (n.d.)
- 200 GAS MASKS**
- M1** Research performed in Section B-6, NDRC. (Informal Report No. XIV.) (n.a.) September 3, 1941.
- M2** [Absorbents for gas masks.] (Informal Report No. CX.) W. Conway Pierce. Northwestern University. May 16, 1942.
- M3** [Absorbents for gas masks.] (Informal Report No. CLIII.) H. F. Johnstone, George L. Clark and others. [University of Illinois.] July 15, 1942.
- M4** Respirators for civilian use. (Informal Report No. CXCI.) W. Conway Pierce. OEMsr-282; Service Project Nos. CWS-7 and NL-B26. Northwestern University. September 9, 1942.
- M5** Summary of results in Section B-6 [from] December, 1940 to August, 1942. (Final report.) W. Albert Noyes, Jr. OEMsr-660; Service Project Nos. CWS-7, NL-B26 and others; OSRD No. 1182. University of Rochester. February 6, 1943.
- M6** Monthly summary report of Sections 10.1 and 10.4 of Division 10, NDRC, for the period of August 15 to September 15, 1943. (n.a.) September 15, 1943.
- M7** Monthly summary reports of Sections 10.1 and 10.5 of Division 10, NDRC, for . . . November 15, 1943; January 15, April 15, June 15, August 15, September 15 and October 15, 1944. (n.a.)
- M8** Monthly summary report of the Central Laboratory, Division 10, NDRC. (n.a.) Northwestern University. April 15, 1945.
- 201 Canister Design, Discussion of**
- M1** Outline of the problem of canister design. ([Informal Report No. XI.] (n.a.) August 15, 1941.
- M2** Agenda for meeting, Pittsburgh. ([Informal Report No. XVII.] (n.a.) Northwestern Technological Institute. September 19, 1941.
- M3** The design of a light weight canister. (Informal Report No. CXXIX.) W. Conway Pierce and Robert K. Brinton. Northwestern University. July 18, 1942.
- M4** Prevention of wall leakage in axial canisters. (Informal Report No. CXCIV.) W. Conway Pierce, Robert K. Brinton and D. P. Smith. OEMsr-282; Service Project No. CWS-7. Northwestern University. October 14, 1942.
- 201.1 Experimentation and Testing with Canisters**
- M1** Flow rate studies on the E-20R48 miniature canister. (Informal Report No. CIV.) Joseph W. Hickey. Northwestern University. April 22, 1942.
- M2** Adsorbent performance data for use in canister designing. (Informal Report No. CV.) J. William Zabor. Northwestern University. April 23, 1942.
- M3** Flow resistance of axial and radial canisters. (Informal Report No. CXXIV.) W. Conway Pierce, David G. Anderson, Jr. and V. C. Lazzaro. Northwestern University. May 15, 1942.
- M4** Correlation of canister test life with human tolerance for cyanogen chloride. The cyanogen chloride protection afforded by humidified adsorbents. (Report No. 295.) W. Conway Pierce, Robert K. Brinton and Thurston Skei. OEMsr-282; Service Project Nos. CWS-7 and NL-B26; OSRD No. 720. Northwestern University. May 29, 1942.
- M5** Leakage of face pieces. (Informal Report No. CLV.) Don M. Yost and Nelson P. Nies. Northwestern University. July 15, 1942.
- M6** Temperatures in canisters and tubes during SA removal. (Informal Report No. CLXII.) Malcolm Dole, Irving M. Klotz and others. Northwestern University. July 25, 1942.
- M7** Retention of HCl by the M-IXA1 canister. (Informal Report No. CLXVII.) W. Conway Pierce and Robert K. Brinton. Northwestern University. July 29, 1942.
- M8** Protection of M-1 and M-IXA1 canisters against sulfur dioxide. (Informal Report No. CLXVI.)

- W. Conway Pierce and Robert K. Brinton. [Northwestern University.] July 29, 1942.
- M9** Relative protection of Dewey and Almy super-soda limes and high-copper whetlerite in the M-10 canister. (Informal Report No. CLXX.) W. Conway Pierce and Robert K. Brinton. Northwestern University. August 5, 1942.
- M10** Tube and canister test methods used at the B-6 Central Laboratory. (Informal Report No. CLXXXII.) W. Conway Pierce. OEMsr-282; Service Project No. CWS-7. Northwestern University. August 20, 1942.
- M11** Studies of canister performance at high humidities and flow rates. (Report No. 446.) W. Conway Pierce. OEMsr-282; Service Project Nos. CWS-7 and NL-B26; OSRD No. 1081. Northwestern University. December 7, 1942.
- M12** An intermittent flow canister test machine. W. Conway Pierce. OEMsr-282; Service Project No. CWS-7; OSRD No. 1193. Northwestern University. January 28, 1943.
- M13** Performance of the M-10 canister against HS under humid tropical conditions. W. Conway Pierce. OEMsr-282; Service Project No. CWS-7; OSRD No. 1194. Northwestern University. February 3, 1943.
- M14** The gas protection of the M-10 canister. W. Conway Pierce. OEMsr-282; Service Project No. CWS-7; OSRD No. 1453. Northwestern University. April 21, 1943.
- M15** Preparation and properties of a new modification of the starch-pyridine-iodine CC indicator for canister testing. (Informal Report No. 10.1-24.) W. Conway Pierce, J. William Zabor and others. Service Project No. CWS-7. Northwestern University. August 12, 1943.
- M16** A meter for the calibration of breather pumps. (Progress Report to August 20, 1943.) W. Conway Pierce, J. William Zabor and D. P. Smith. OEMsr-282; Service Project No. CWS-7; OSRD No. 1872. Northwestern University. October 1, 1943.
- M17** Canister surveillance studies. ([Part] I. Informal Report No. 10.1-32.) W. Conway Pierce, Thurston Skei and Robert K. Brinton. Service Project No. CWS-7. Northwestern University. October 14, 1943.
- M18** Canister surveillance studies. ([Part] II. Supplement . . . for the period [from] October 15 to November 15, 1943.) Thurston Skei, Carolyn Palmer and others. Northwestern University. [November, 1943.]
- M19** Apparatus and method for determining gas mask outlet valve leakage under conditions of use. (Progress Report to October 12, 1943.) D. P. Smith and J. William Zabor. OEMsr-282; Service Project No. CWS-7; OSRD No. 1984. Northwestern Technological Institute. November 4, 1943.
- M20** Apparatus for evaluating the maximum inspiratory and expiratory resistances of gas masks during wearing. (Progress Report to October 1, 1943.) W. Conway Pierce, J. William Zabor and D. P. Smith. OEMsr-282; Service Project No. CWS-7; OSRD No. 1982. Northwestern University. November 4, 1943.
- M21** Canister protection for gases. A survey. W. Conway Pierce and J. William Zabor. November 16, 1943.
- M22** Performance of canisters after wearing tests at Camp Sibert, Alabama. (Progress Report to December 14, 1943.) W. Conway Pierce, J. William Zabor and H. S. Joseph. OEMsr-282; Service Project No. CWS-7; OSRD No. 3058. Northwestern University. December 31, 1943.
- M23** A study of the effect of uniformity of activation of sieve fractions on CC canister performance for mixtures of PCI charcoals. (Informal Report No. 10.5-21.) Jon C. Cooper, R. J. Kunz and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. March 14, 1944.
- M24** Canister efficiency of CC removal at varied breathing rates. (Informal Report No. 10.1-43.) David B. Ehrlinger, J. William Zabor and W. Conway Pierce. OEMsr-282; Service Project No. CWS-7. Northwestern University. March 29, 1944.
- M25** Canister protection at high concentrations. (Informal Report No. 10.1-42.) Robert K. Brinton, J. B. Fehrenbacher and Virginia Johnson. OEMsr-282; Service Project No. CWS-7. Northwestern University. March 30, 1944.
- M26** Factors in canister design and tube testing: critical bed depth and the nature of gas flow through charcoal. (Report to May 18, 1944.) Irving M. Klotz. OEMsr-282; Service Project No. CWS-7; OSRD No. 3774. Northwestern University. June 13, 1944.
- M27** Volume requirements for a carbon monoxide canister for use with diluter-demand regulator equipment. (Informal Report No. 10.1-47.) Robert N. Pease and Charles Orenyo. NDCrc-131; Service Project No. CWS-7. Princeton University. June 15, 1944.
- M28** Performance of M-10 and M-IXA2 canisters after regular use at Camp Sibert, Alabama. (Report to July 22, 1944.) Thurston Skei, J. B. Fehrenbacher and H. S. Joseph. OEMsr-282; Service Project No. CWS-7; OSRD No. 4014. Northwestern University. August 12, 1944.
- M29** Additional surveillance tests on canisters used in the first Sibert surveillance study. (Report to July 24, 1944.) Thurston Skei. OEMsr-282; Service Project No. CWS-7; OSRD No. 4015. Northwestern University. August 12, 1944.
- M30** Accelerated aging studies. ([Part] IX. Supplement to Monthly Summary Report [of] August 15, 1944.) Thurston Skei, Carolyn Palmer and others. Northwestern University. [August 15, 1944.]
- M31** Surveillance of Type ASC whetlerite in M-10 5/8" service canisters. Thurston Skei. OEMsr-282; Service Project No. CWS-7; OSRD No. 4231. Northwestern University. October 3, 1944.
- M32** The use of pyridine and picoline in gas mask

charcoal. (Informal Report No. 10.1-56.) Louis C. Weiss, Gerald L. Pratt and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. November 16, 1944.

M33 Factors in canister design and tube testing. [Part] II, Critical bed depths in removal of CC by the E-3 or M-11 canister. (Informal Report No. 10.1-57.) Irving M. Klotz, J. B. Fehrenbacher and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. November 28, 1944.

M34 Results of canister tests against carbon monoxide. (Report to December 31, 1944.) Robert N. Pease and Charles Orenyo. NDCrc-131; Service Project Nos. CWS-7, NA-106(3) and NS-338; OSRD No. 4896. Princeton University. April 5, 1945.

M35 Performance of M-10, M-10A1 and M-1A1 canisters after use in the Southwest Pacific Area. J. B. Fehrenbacher, Betty Roake and others. OEMsr-282; Service Project Nos. CWS-7 and NS-338; OSRD No. 4928. Northwestern Technological Institute. April 12, 1945.

M36 The determination of ammonia in low concentrations evolved from canisters. W. B. Lewis and Francis E. Blacet. OEMsr-282; Service Project Nos. CWS-7 and NS-338; OSRD No. 5235. Northwestern Technological Institute. June 21, 1945.

201.2 Mesh Size and Filters

M1 Filter materials. (Report No. 39.) W. H. Rodebush. NDCrc-49; Service Project No. CWS-1; OSRD No. 101. University of Illinois. June 12, 1941.

M2 The behavior of mixtures of charcoal and inert material. (Informal Report No. XCIX.) B. M. Abraham. Northwestern University. April 10, 1942.

201.21 Particle Size of Charcoal

M1 Mesh size studies. [Part] I. Informal Report No. 10.1-11.) W. Conway Pierce, J. William Zabor and others. OEMsr-282. Northwestern University. April 12, 1943.

201.22 Aerosol Filters and Filtration

M1 Aerosol filter materials. (Report No. 58.) (n.a.) NDCrc-49; Service Project No. CWS-1; OSRD No. 120. University of Illinois. July 24, 1941.

M2 Sources of mineral fiber and dispersion of asbestos. (Report No. 169, to November 15, 1941.) (n.a.) OEMsr-83; Service Project No. CWS-1; OSRD No. 336. Arthur D. Little, Inc. November 3, 1941.

M3 Aerosol filter materials. (Report No. 106.) W. H. Rodebush. NDCrc-49; Service Project No. CWS-1; OSRD No. 168. University of Illinois. November 7, 1941.

M4 Preparation of asbestos fibers of small diameter and preliminary tests on dispersion of solids in a special machine. (Report No. 178.) (n.a.) OEMsr-219; Service Project No. CWS-15; OSRD No. 431. Arthur D. Little, Inc. March 2, 1942.

M5 Filtration of aerosols and the development of filter materials. (Report No. 353.) W. H. Rodebush, Irving Langmuir and Victor K. LaMer. OEMsr-108, NDCrc-104 and OEMsr-148; Service Project Nos. CWS-15 and NL-B34; OSRD No. 865. University of Illinois, General Electric Company and Columbia University. September 4, 1942.

M6 Studies and investigations in connection with the dispersion of solids. (Report No. 419.) (n.a.) OEMsr-219; Service Project No. CWS-15; OSRD No. 962. Arthur D. Little, Inc. October 31, 1942.

M7 Preparation of superfine organic fibers from cellulose esters. (Report No. 432.) R. B. Hickey, P. H. Schneider and others. OEMsr-272; Service Project No. CWS-15; OSRD No. 1048. Tennessee Eastman Corporation. November 26, 1942.

M8 Dispersion of fine fibers and solids. (Informal Report No. 10.4-2, for the period [from] November 15 to December 15, 1942.) (n.a.) OEMsr-219; Service Project No. CWS-15. Arthur D. Little, Inc. December 18, 1942.

M9 Asbestos-impregnated filter papers. (Informal Report No. 10.4-6.) (n.a.) OEMsr-219; Service Project No. CWS-15. Arthur D. Little, Inc. January 15, 1943.

M10 Dispersion of asbestos fibers. Filter paper products. (Informal Report Nos. 10.4-9, -13 and -16, for the period January 1 to April 1, 1943.) Earl P. Stevenson and Earl Stafford. OEMsr-219; Service Project No. CWS-15. Arthur D. Little, Inc. February 10, March 10 and April 9, 1943.

M11 A colorimetric method of determining the mass concentration of triphenyl phosphate smokes. (Informal Report No. 10.1-6.) Frank T. Gucker, Jr. and Hugh B. Pickard. OEMsr-282; Service Project No. NL-B34. Northwestern University. February 24, 1943.

M12 Unipolar smoke and filter penetration. (Informal Report No. 10.2-2.) Victor K. LaMer, Frank Brescia and David Sinclair. OEMsr-148; Service Project No. CWS-1. Columbia University. August, 1943.

M13 Filter penetration by aerosols of very small particle size. (Progress Report to September 1, 1943.) W. H. Rodebush, C. E. Holley, Jr. and B. A. Lloyd. OEMsr-108; Service Project No. CWS-15; OSRD No. 2050. University of Illinois. November 24, 1943.

M14 Smokes and filters. (Supplement to Section I and Section II. Report to January, 1944.) Irving Langmuir and Katherine B. Blodgett. OEMsr-131; Service Project Nos. CWS-15 and NL-B34; OSRD No. 3460. General Electric Company. April 12, 1944.

M15 Asbestos-bearing filter paper. (Final report.) T. L. Wheeler and Earl Stafford. OEMsr-219; Service Project Nos. CWS-16, CWS-17 and NL-B34; OSRD No. 4378. Arthur D. Little, Inc. November 23, 1944.

M16 A sensitive photoelectric smoke penetrometer.

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Frank T. Gucker, Jr., Hugh B. Pickard and C. T. O'Konski. OEMsr-282; Service Project Nos. CWS-7 and NS-338; OSRD No. 5499. Northwestern Technological Institute. August 28, 1945.

201.3 Foreign Types of Canisters

201.31 Tests

- M1** Italian canister, large size, D.z.g.c 3-1934. (Informal Report No. CVIII.) Edwin O. Wiig, L. V. McCarty and others. University of Rochester. May 15, 1942.
- M2** Foreign canisters and canister fillings. (Informal Report No. CLXXI.) Frank T. Gucker, Jr. August 1, 1942.
- M3** Gas protection afforded by German canisters. J. B. Fehrenbacher and Francis E. Blacet. OEMsr-282; Service Project Nos. CWS-7 and NS-338; OSRD No. 4929. Northwestern Technological Institute. April 12, 1945.
- M4** Gas protection afforded by Japanese canisters. J. B. Fehrenbacher and Francis E. Blacet. OEMsr-282; Service Project Nos. CWS-7 and NS-338; OSRD No. 5238. Northwestern Technological Institute. May 30, 1945.

201.32 Comparison with American Types

- M1** The vulnerability of United States, Canadian and British canisters toward CC at high humidities. W. Conway Pierce. OEMsr-282; Service Project No. CWS-7; OSRD No. 1350. Northwestern University. April 20, 1943.
- M2** A comparison of Canadian and American light-type canisters. W. Conway Pierce. OEMsr-282; Service Project No. CWS-7; OSRD No. 1456. Northwestern University. May 25, 1943.
- M3** The protection of United States and enemy canisters against nitrogen dioxide. W. B. Lewis, J. W. Thomas and Francis E. Blacet. OEMsr-282; Service Project Nos. CWS-7 and NS-338; OSRD No. 5343. Northwestern Technological Institute. July 18, 1945.

202 Absorbents

- M1** Studies of the preparation and evaluation of gas mask absorbents. A summary of the activities of Section B-6 to August 7, 1942. (Report No. 407.) Francis E. Blacet, Malcolm Dole and others. OEMsr-586, OEMsr-282 and others; Service Project Nos. CWS-7, NL-B26 and NL-B28; OSRD No. 1028. University of Chicago, Northwestern University and others. August 8, 1942.

202.01 Foreign Absorbents

- M1** Nature of the impregnant and new absorbents. ([Informal Report No. L.] H. F. Johnstone and George L. Clark. University of Illinois. December 26, 1941.
- M2** Gas protection of Australian coconut charcoal. J. B. Fehrenbacher and Francis E. Blacet. OEMsr-282; Service Project Nos. CWS-7 and NS-338;

OSRD No. 4930. Northwestern Technological Institute. April 12, 1945.

202.I Charcoal

- M1** Fundamental study of charcoals and whetlerites. (Informal Report No. LXXIV.) H. F. Johnstone and George L. Clark. University of Illinois. February 13, 1942.
- M2** Studies of the preparation and evaluation of gas mask absorbents. A summary of the activities of Section B-6 to March 13, 1942. (Report No. 221.) Warren L. McCabe, Robert York, Jr. and others. NDCrc124, NDCrc-119 and others; Service Project No. CWS-7; OSRD No. 496. Carnegie Institute of Technology, Johns Hopkins University and others. March 13, 1942.
- M3** Carbonization of resins and other plastics. Nature of reaction product from arsine on whetlerite. X-ray studies. (Informal Report No. CXXXI.) H. F. Johnstone and George L. Clark. University of Illinois. June 11, 1942.
- M4** Preliminary study of whetlerites from different size extruded charcoals [and] charcoals activated at different temperatures. (Informal Report No. CXLIV.) David H. Volman, Francis E. Blacet and George J. Doyle. Northwestern University. June 23, 1942.
- M5** Temperatures in canisters and tubes during SA removal. (Report No. 325.) Malcolm Dole, Irving M. Klotz and others. OEMsr-282; Service Project Nos. CWS-7 and NL-B26; OSRD No. 851. Northwestern University. July 25, 1942.
- M6** Study of commercial whetlerites. Work on charcoal. (Informal Report No. CCII, for the period from September 15 to October 15, 1942.) H. F. Johnstone, George L. Clark and others. OEMsr-599; Service Project No. CWS-7. University of Illinois. October 15, 1942.
- M7** Experiments with Type AS whetlerites at Fostoria, Columbus and Zanesville, Ohio. (Report No. 471.) Francis E. Blacet. OEMsr-282; Service Project No. CWS-7; OSRD No. 1126. Northwestern University. December 9, 1942.
- M8** [Absorbents for gas masks.] (Monthly Summary Reports of Sections 10.1, 10.4 and 10.5 for . . . January 15, February 15, March 15, April 15, May 15, June 15, August 15, October 15, December 15, 1943, February 15, March 15, May 15, July 15, November 15, December 15, 1944 and January 15, 1945.) H. F. Johnstone, Francis E. Blacet and others.
- M9** Some mathematical theories for charcoal tube testing. (Informal Report No. 10.1-12.) Don M. Yost and Don S. Martin, Jr. OEMsr-282. Northwestern University. April 30, 1943.
- M10** Summary of investigations by the Engineering Pilot Group. ([Parts] VII, IX and XI to XVIII. Informal Report Nos. 10.4-23 and -31; 10.5-4, -5, -8, -13, -16, -19, -27 and -31, for the period May 10 to August 10, 1943 and September 10, 1943 to May 10, 1944.) R. J. Kunz, Jon C. Cooper and

others. OEMsr-282; Service Project No. CWS-7. Northwestern University.

- M11** ASCM whetlerite. Edwin O. Wiig, Herbert Scoville, Jr. and others. OEMsr-548; Service Project No. CWS-7; OSRD No. 1454. University of Rochester. May 25, 1943.
- M12** G. L. Cabot carbon black charcoals. (Informal Report No. 10.1-15.) Francis E. Blacet and Thurston Skei. OEMsr-282; Service Project No. CWS-7. Northwestern University. June 3, 1943.
- M13** Leaching and rewhetlerization of impregnated charcoals. Robert J. Grabenstetter, Louis C. Weiss and Francis E. Blacet. OEMsr-282; Service Project Nos. CWS-7 and NS-338; OSRD No. 5237. Northwestern Technological Institute. June 21, 1945.

202.11 Physical Properties and Structure of Charcoal

- M1** On the structure of charcoal. (Informal Report No. V.) T. F. Young. University of Chicago. June 18, 1941.
- M2** The increase in weight of charcoal at the breakpoint. (Informal Report No. XXVI.) Malcolm Dole. Northwestern University. August 29, 1941.
- M3** A study of the physical variables in the production of Type A and Type AS whetlerites from CWSN-44, CWSNC-1 and CWSPCI-1 charcoals. (Informal Report No. CCXXVI, for the period June to October, 1942.) Francis E. Blacet, David H. Volman and George J. Doyle. OEMsr-282; Service Project No. CWS-7. Northwestern University. November 5, 1942.
- M4** The fixed oxygen content of charcoal. (Informal Report No. CCXV.) Robert N. Pease, Nat C. Robertson and others. NDCrc-131; Service Project No. CWS-7. Princeton University. November 20, 1942.
- M5** Changes in properties of Barnebey-Cheney Company pecan charcoal and whetlerite during activation. (Informal Report No. 10.1-22.) Francis E. Blacet, Thurston Skei and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. July 27, 1943.
- M6** Effect of activation time on properties of PCI charcoal and corresponding whetlerites. (Second Report.) Francis E. Blacet, W. Conway Pierce and Thurston Skei. OEMsr-282; Service Project No. CWS-7; OSRD No. 1746. Northwestern University. August 10, 1943.
- M7** Analyses of base charcoals. (Progress Report to June 11, 1943.) Edwin O. Wiig and John F. Flagg. OEMsr-548; Service Project No. CWS-7; OSRD No. 1780. University of Rochester. September 6, 1943.
- M8** Adsorption of nitrogen on CWSN base charcoals. (Informal Report No. 10.5-3.) Paul H. Emmett, James Holmes and others. NDCrc-119; Service Project No. CWS-7. Johns Hopkins University. September 11, 1943.
- M9** The effect of the activation process on the nitrogen adsorption and whetlerite properties of PCI and Carlisle chars. (Informal Report No. 10.5-7.)

Robert York, Jr., David G. Edwards and others. OEMsr-580; Service Project No. CWS-7. Carnegie Institute of Technology. December 1, 1943.

- M10** A systematic study of pressure drop in beds of charcoal. A summary of work completed in May, 1943. (Informal Report No. 10.5-26.) David G. Anderson, Jr. and R. J. Kunz. OEMsr-282; Service Project No. CWS-7. Northwestern University. April 24, 1944.

202.111 Pore Size

- M1** Pore size alteration of charcoal. (Informal Report No. 10.5-12.) Paul H. Emmett and James Holmes. NDCrc-119; Service Project No. CWS-7. Johns Hopkins University. November 12, 1943.
- M2** The effect of pore size and pore size distribution on the performance of ASC whetlerites at high humidities. (Informal Report No. 10.1-40.) J. William Zabor and Arvo J. Juhola. OEMsr-282; Service Project No. CWS-7. Northwestern University. February 11, 1944.
- M3** A study of pore development and ASC whetlerite performance of charcoals prepared from briquetted coal. (Informal Report No. 10.1-46.) Arvo J. Juhola, Thurston Skei and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. June 28, 1944.
- M4** Determination of pore diameters in charcoal. (Informal Report No. 10.1-58.) Arvo J. Juhola and Francis E. Blacet. OEMsr-282; Service Project No. CWS-7. Northwestern University. January 24, 1945.
- M5** Survey of pore structure in charcoal. Arvo J. Juhola, Francis E. Blacet and others. OEMsr-282; Service Project Nos. CWS-7 and NS-338; OSRD No. 5500. Northwestern Technological Institute. August 28, 1945.

202.12 Manufacture of Charcoal.

- M1** Study of the preparation of whetlerite and of promoted whetlerites. (Informal Report No. VII.) J. C. Elgin. Princeton University. July 16, 1941.
- M2** Adsorbents for gas masks. Report on activities of Section B-6. (Informal Report No. XXXIV.) (n.a.) October 29, 1941.
- M3** A study of the physical variables in the production of whetlerite and silvered whetlerite. (Report No. 264.) Francis E. Blacet. OEMsr-282; Service Project No. CWS-7; OSRD No. 621. Northwestern University. June 9, 1942.
- M4** Production of primary charcoal by the Carlisle process. (Informal Report No. CXXXV.) Warren L. McCabe and Leonard Byman. Carnegie Institute of Technology. June 16, 1942.
- M5** The preparation of crude char. (Informal Report No. CLXV.) Warren L. McCabe. Carnegie Institute of Technology. July 16, 1942.
- M6** Preparation of wood charcoal. (Report No. 403.) Warren L. McCabe. OEMsr-116; Service Project

No. CWS-7; OSRD No. 1002. Carnegie Institute of Technology. October 21, 1942.

- M7** The preparation from wood of charcoal suitable for activation. (Informal Report No. CCXIII, for the period [from] October 15 to November 15, 1942.) Warren L. McCabe, Leonard Byman and others. OEMsr-116; Service Project No. CWS-7. Carnegie Institute of Technology. November 15, 1942.
- M8** The preparation of wood charcoal suitable for activation. (Progress Report to January 15, 1943.) Warren L. McCabe. OEMsr-116; Service Project No. CWS-7; OSRD No. 1280. Carnegie Institute of Technology. March 20, 1943.
- M9** ASM whetlerite. Edwin O. Wiig. OEMsr-548; Service Project No. CWS-7; OSRD No. 1455. University of Rochester. May 25, 1943.
- M10** Type ASM whetlerite prepared in rotary drier, laboratory scale. (Progress Report to July 2, 1943.) Edwin O. Wiig, Francis E. Blacet and others. OEMsr-282; Service Project No. CWS-7; OSRD No. 1693. Northwestern University. August 6, 1943.
- M11** The preparation of wood charcoal suitable for activation. (Final Report to August 16, 1943.) Warren L. McCabe, Leonard Byman and others. OEMsr-116; Service Project No. CWS-7; OSRD No. 1856. Carnegie Institute of Technology. September 29, 1943.
- M12** Preparation and properties of ASV whetlerite. (Progress Report to September 2, 1943.) Edwin O. Wiig, Herbert Scoville, Jr. and others. OEMsr-548; Service Project No. CWS-7; OSRD No. 1912. University of Rochester. October 13, 1943.
- M13** An investigation of the applicability of ASC-type whetlerizing equipment to the preparation of ASM whetlerite. (Informal Report No. 10.5-28.) Edward H. Conroy, R. J. Kunz and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. March 15, 1944.
- M14** Summary of pilot studies of the preparation of ASC whetlerite. (Report to August 15, 1944.) R. J. Kunz. OEMsr-282; Service Project No. CWS-7; OSRD No. 4129. Northwestern University. September 14, 1944.
- M15** A study of the carbonization of coal materials. (Informal Report No. 10.5-49.) Byron A. White, Leonard Byman and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. November 24, 1944.

202.13 Activated Charcoal

- M1** A search for promoter activity in whetlerites. (Informal Report No. LXII.) Francis E. Blacet. University of California at Los Angeles. December 26, 1941.
- M2** Activation of charcoal. ([Informal] Report No. LVIII.) Warren L. McCabe. Carnegie Institute of Technology. December 29, 1941.
- M3** Adsorption, surface area and pore size studies on activated charcoals and whetlerite. ([Informal Report No. LII.] Paul H. Emmett. Johns Hopkins University. December 29, 1941.
- M4** Activation of charcoal. Effect of varying gas mixtures and temperatures. (Informal Report No. LXXIII.) Warren L. McCabe. Carnegie Institute of Technology. February 15, 1942.
- M5** Activation of charcoal and of anthracite. (Informal Report No. LXXXVI.) Warren L. McCabe and Robert York, Jr. Carnegie Institute of Technology. March 15, 1942.
- M6** A laboratory study of activation. (Informal Report No. CXXXVI.) Robert York, Jr. Carnegie Institute of Technology. June 15, 1942.
- M7** Oxygen treatment of charcoal. Heats of combustion of charcoals. (Informal Report No. CLX, for the period from June 15 to July 15, 1942.) T. F. Young. University of Chicago. [July, 1942.]
- M8** Activation of charcoal. (Informal Report No. CLXIV.) Robert York, Jr. [Carnegie Institute of Technology.] July 15, 1942.
- M9** Summary of investigations at the Activation Laboratory. (Informal Report Nos. 10.4-3, -4, -8, -11, -15 and -19, for the period [from] November 15, 1942 to May 10, 1943.) R. J. Kunz, David G. Anderson, Jr. and others. OEMsr-282; Service Project No. CWS-7. Northwestern University.
- M10** Changes in properties of PCI charcoal and whetlerite during activation. (Informal Report No. 10.1-8.) Francis E. Blacet and Thurston Skei. OEMsr-282. Northwestern University. March 12, 1943.
- M11** Weight and size losses during laboratory activation of PCI char. (Informal Report No. 10.4-14, covering period [from] January 15 to March 15, 1943.) Robert York, Jr., David G. Edwards and others. NDCrc-124; Service Project No. CWS-7. Carnegie Institute of Technology. April 1, 1943.
- M12** Changes in properties of PCI charcoal and whetlerite during activation. Francis E. Blacet and Thurston Skei. OEMsr-282; Service Project No. CWS-7; OSRD No. 1349. Northwestern University. April 20, 1943.
- M13** Activation of charcoal in a boiling-bed furnace. (Informal Report Nos. 10.4-18 and 10.5-6, for . . . May 1, 1943 and November 12, 1943.) Robert York, Jr., David G. Edwards and others. OEMsr-580; Service Project No. CWS-7. Carnegie Institute of Technology.
- M14** The non-uniform activation of charcoals. (Informal Report No. 10.1-18.) Francis E. Blacet, Thurston Skei and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. June 15, 1943.
- M15** Summary of investigations by the Engineering Pilot Group. ([Part] VIII. Informal Report No. 10.4-27, for the period [from] June 10 to July 10, 1943.) R. J. Kunz, Jon C. Cooper and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. July 10, 1943.
- M16** Composition of gases evolved during activation. (In-

- formal Report No. 10.4-30, for the period [from] March 1 to August 1, 1943.) Robert York, Jr., David G. Edwards and others. OEMsr-580; Service Project No. CWS-7. Carnegie Institute of Technology. August 1, 1943.
- M17** An hypothesis of the activation mechanism in charcoal. (Informal Report No. 10.5-14.) Robert York, Jr., David G. Edwards and others. OEMsr-580; Service Project No. CWS-7. Carnegie Institute of Technology. February 1, 1944.
- M18** Zinc chloride activated wood charcoal. (Parts III to X. Informal Report Nos. 10.5-17, -22, -29, -32, -34, -38, -43 and -46, for . . . February 10 to August 10, 1944.) George W. Heise, J. A. Slyh and others. OEMsr-1200; Service Project No. CWS-7. National Carbon Company, Inc.
- M19** Nitrogen surface area measurements on a series of PCI samples subjected to steam activation for various periods of time. (Informal Report No. 10.5-20, to November 11, 1943.) Paul H. Emmett and J. T. Kummer. NDCrc-119; Service Project No. CWS-7. Johns Hopkins University. March 1, 1944.
- M20** A modified boiling-bed furnace for charcoal activation by steam. (Parts III and IV. Informal Report Nos. 10.5-18 and -33, for . . . March 1, 1944 and May 23, 1944.) Robert York, Jr., David G. Edwards and others. OEMsr-580; Service Project No. CWS-7. Carnegie Institute of Technology.
- M21** Activation of charcoal in a boiling-bed furnace. (Progress Report to June 23, 1944.) Robert York, Jr., David G. Edwards and others. OEMsr-580; Service Project No. CWS-7; OSRD No. 4011. Carnegie Institute of Technology. August 12, 1944.
- M22** A study of the steam activation of various charcoals in a small horizontal rotary retort. (Informal Report No. 10.5-42.) Donald Holmes, R. J. Kunz and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. August 14, 1944.
- M23** Whetlerization and surveillance studies on PCI charcoal at varying stages of activation. (Third Report to August 12, 1944.) Thurston Skei. OEMsr-282; Service Project No. CWS-7; OSRD No. 4112. Northwestern University. September 9, 1944.
- M24** Zinc chloride activated wood charcoal. George W. Heise, J. A. Slyh and others. OEMsr-1200; Service Project Nos. CWS-7 and NL-B28; OSRD No. 4324. National Carbon Company, Inc. September 30, 1944.
- M25** The effect of treating activated charcoal with air or air-steam mixtures at elevated temperatures. Clarence R. Bierman, Gerald L. Pratt and Byron A. White. OEMsr-282; Service Project Nos. CWS-7 and NS-338; OSRD No. 5240. Northwestern Technological Institute. June 21, 1945.
- M26** Gas and chemical activation of charcoal. (Final Report covering the period [from] July 31, 1942 to August 31, 1944.) Robert York, Jr. and others. OEMsr-580; Service Project Nos. CWS-7 and NS-338; OSRD No. 5278. Carnegie Institute of Technology. June 29, 1945.
- M27** The physical chemistry of the activation of charcoal. (Final Report to May 22, 1945.) T. F. Young. OEMsr-586; Service Project Nos. CWS-7 [and NS-338]; OSRD No. 5354. University of Chicago. July 21, 1945.
- 202.131 Jiggler Process**
- M1** Activation of charcoal. Comparison of jiggler and pilot plant operation. (Informal Report No. LXVII.) Warren L. McCabe. Carnegie Institute of Technology. January 15, 1942.
- M2** The design of a pilot plant jiggler for charcoal activation. (Informal Report No. CXVIII.) Robert York, Jr. Carnegie Institute of Technology. May 15, 1942.
- M3** Activation of gas charcoal by a new jiggler process. (Report No. 390.) Robert York, Jr., Clay Lewis and others. NDCrc-124; Service Project No. CWS-7; OSRD No. 956. Carnegie Institute of Technology. July 31, 1942.
- M4** Further development of a laboratory-type jiggler for activating gas charcoal, and tentative results of gasification rate studies. (Progress Report to February 28, 1943.) Robert York, Jr., David G. Edwards and others. OEMsr-580; Service Project No. CWS-7; OSRD No. 1521. Carnegie Institute of Technology. June 17, 1943.
- M5** Summary of investigations by the Engineering Pilot Group. (Part X. Informal Report No. 10.5-2.) R. J. Kunz, Leonard Byman and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. September 10, 1943.
- M6** Preliminary design and cost estimate for five-ton per day activation plant based on jiggler process. (Informal Report No. 10.5-10.) Edward H. Conroy, Jon C. Cooper and Robert H. Rogge. OEMsr-282; Service Project No. CWS-7. Northwestern University. January 15, 1944.
- M7** Activation of charcoal by the jiggler process. A summary of the results obtained in the first two pilot models. (Informal Report No. 10.5-25.) Robert H. Rogge, R. J. Kunz and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. March 20, 1944.
- M8** The effect of time and temperature of activation on the properties of PCI charcoal activated in the jiggler pilot plant. (Informal Report No. 10.5-24.) Jon C. Cooper, R. J. Kunz and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. March 25, 1944.
- M9** The effect of time and temperature of activation upon the properties of Barnebey-Cheney and Carlisle charcoals processed in the jiggler pilot activator. (Informal Report No. 10.5-37.) Clarence R. Bierman, R. J. Kunz and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. June 30, 1944.
- M10** Design, construction and operating characteristics of the third pilot jiggler activator. (Informal Report No. 10.5-36.) O. J. Parr, R. J. Kunz and

others. OEMsr-282; Service Project No. CWS-7. Northwestern University. July 10, 1944.

- M11** Activation of charcoal by the juggler process. Factors, other than time-temperature, affecting product quality and yield. (Informal Report No. 10.5-35.) Robert H. Rogge, R. J. Kunz and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. July 14, 1944.

- M12** Final design and cost estimate for a two-ton per day activator using the juggler process. (Informal Report No. 10.5-45.) Jon C. Cooper and R. J. Kunz. [OEMsr-282;] Service Project No. CWS-7. Northwestern University. August 15, 1944.

- M13** Activation of charcoal by the juggler process. A summary of the results obtained in the fourth, metal tube, pilot model. (Progress Report to August 15, 1944.) Robert H. Rogge and R. J. Kunz. OEMsr-282; Service Project Nos. CWS-7 and NL-B28; OSRD No. 4283. Northwestern University. October 23, 1944.

202.132 Reactivation

- M1** The effects of reactivation on the properties of certain activated charcoals. (Informal Report No. CCIV, for the period [from] September 15 to October 15, 1942.) T. F. Young, Sol W. Weller and Sidney L. Simon. OEMsr-586; Service Project No. CWS-7. University of Chicago. October 21, 1942.
- M2** The reactivation in oxygen of Chemical Warfare Service charcoals. (Progress Report to August 4, 1944.) T. F. Young. OEMsr-586; Service Project No. CWS-7; OSRD No. 4104. University of Chicago. September 7, 1944.

202.133 Zinc Chloride Method

- M1** Study of Zinc chloride carbon. ([Parts] I and II. Informal Report Nos. 10.5-11 and -15, for November and December, 1943.) George W. Heise, J. A. Slyh and others. OEMsr-1200; Service Project No. CWS-7. National Carbon Company, Inc. December 10, 1943 and January 10, 1944.

202.134 Charcoals from Miscellaneous Sources.

- M1** The carbonization of Pres-to-logs. (Informal Report No. CLXXXIII.) Warren L. McCabe, Leonard Byman and others. OEMsr-116; Service Project No. CWS-7. Carnegie Institute of Technology. August 13, 1942.
- M2** Activation of carbonized Pres-to-logs. (Informal Report No. 10.5-1.) Robert York, Jr., David G. Edwards and others. OEMsr-116; Service Project No. CWS-7. Carnegie Institute of Technology. September 1, 1943.
- M3** Activation of carbonized peach pits and black walnut shells in PCI retorts. (Informal Report No. 10.5-9.) Robert York, Jr., David G. Edwards and others. OEMsr-580; Service Project No. CWS-7. Carnegie Institute of Technology. December 15, 1943.
- M4** Carbonization of peach pits and their preparation

into ASC whetlerite. (Informal Report No. 10.5-39.) Byron A. White and R. J. Kunz. OEMsr-282; Service Project No. CWS-7. Northwestern University. July 15, 1944.

- M5** Studies of the preparation of activated charcoal suitable for whetlerization from coconut shells. Byron A. White, Clarence R. Bierman and others. OEMsr-282; Service Project Nos. CWS-7 and NS-338; OSRD No. 5116. Northwestern Technological Institute. May 24, 1945.

202.14 Impregnated Charcoal

- M1** Study of impregnation. ([Informal Report No.] XXVII.) J. C. Elgin. Princeton University. August 30, 1941.
- M2** Impregnation. (Informal Report No. XXXV.) J. C. Elgin. Princeton University. October 22, 1941.
- M3** Studies on impregnation. (Informal Report No. XXXVII.) Allan P. Colburn. University of Delaware. October 31, 1941.
- M4** Studies of impregnated charcoals. (Report No. 110, to August 10, 1941.) H. F. Johnstone and George L. Clark. NDCrc-152; Service Project No. CWS-7; OSRD No. 172. University of Illinois. November 8, 1941.
- M5** A study of whetlerites. (Informal Report No. LVII.) T. F. Young, Sidney L. Simon and Sol W. Weller. University of Chicago. December 26, 1941.
- M6** Performance data on some recent samples. (Informal Report No. LXXVIII.) W. Albert Noyes, Jr. University of Rochester. February 17, 1942.
- M7** Studies on impregnation. (Report No. 250.) J. C. Elgin. NDCrc-106; Service Project No. CWS-7; OSRD No. 586. Princeton University. April 9, 1942.
- M8** A comparison of impregnated charcoals. (Informal Report No. CXIX.) Francis E. Blacet, Thurston Skei and R. V. Yount. Northwestern University. May 5, 1942.
- M9** The adsorption of silver on charcoal from whetlerizing solutions. (Informal Report No. CXX.) Francis E. Blacet and David H. Volman. Northwestern University. May 18, 1942.
- M10** The distribution of the catalyst in whetlerite. The location and the identification of the reaction products in whetlerite treated with arsine. (Report No. 292.) H. F. Johnstone and George L. Clark. NDCrc-152; OSRD No. 704. University of Illinois. June 1, 1942.
- M11** Optimum concentrations of copper, ammonia and carbon dioxide for whetlerizing solutions. (Informal Report No. CXLIII.) Francis E. Blacet, David H. Volman and George J. Doyle. Northwestern University. June 22, 1942.
- M12** The comparison of impregnated charcoals. (Second Report. Informal Report No. CXLVII.) Thurston Skei, Francis E. Blacet and R. V. Yount. Northwestern University. June 29, 1942.
- M13** The effects of cuprous copper and nitrate ions in whetlerizing solutions. The minimum silver re-

- quirements for different activated charcoals. (Informal Report No. CLXVIII.) David H. Volman and Francis E. Blacet. Northwestern University. July 28, 1942.
- M14** The solubility of silver thiocyanate in whetlerizing solution. The adsorption of silver ions and thiocyanate ions by charcoal from solutions. (Informal Report No. CLXXVII.) Francis E. Blacet and David H. Volman. OEMsr-282; Service Project No. CWS-7. Northwestern University. August 3, 1942.
- M15** A study of thiocyanate-treated whetlerites. (Informal Report No. CCX, for the period [from] May 15 [to] September 15, 1942.) Francis E. Blacet, Thurston Skei and others. [OEMsr-282;] Service Project No. CWS-7. Northwestern University. September 17, 1942.
- M16** Adsorption of constituents from a standard whetlerizing solution. (Informal Report No. CCXXIII.) Francis E. Blacet, David H. Volman and George J. Doyle. OEMsr-282; Service Project No. CWS-7. Northwestern University. November 5, 1942.
- M17** Miscellaneous experiments with National charcoals. The minimum silver requirements of CWSN-C1 charcoal. (Informal Report No. CCXXIV.) Francis E. Blacet, David H. Volman and George J. Doyle. OEMsr-282; Service Project No. CWS-7. Northwestern University. November 10, 1942.
- M18** The comparison of impregnated charcoals. (Third Report No. 470.) Francis E. Blacet. OEMsr-282; Service Project Nos. CWS-7 and NL-B28; OSRD No. 1125. Northwestern University. December 9, 1942.
- M19** Study of impregnation. (Informal Report No. LV.) J. C. Elgin. Princeton University. December 22, 1942.
- M20** Composition of gas evolved from drying whetlerites. Francis E. Blacet. OEMsr-282; Service Project No. CWS-7; OSRD No. 1201. Northwestern University. January 4, 1943.
- M21** Analytical methods for whetlerites and whetlerizing solutions. Francis E. Blacet. OEMsr-282; Service Project No. CWS-7; OSRD No. 1175. Northwestern University. February 3, 1943.
- M22** A study of the partial vapor pressure of the volatile constituents in whetlerizing solutions. (Informal Report No. 10.1-7.) Francis E. Blacet and David H. Volman. OEMsr-282. Northwestern University. March 19, 1943.
- M23** The preparation and surveillance of hexamethylenetetramine impregnated charcoals. (Progress Report to March 9, 1943.) Francis E. Blacet and Jack G. Roof. OEMsr-282; Service Project No. CWS-7; OSRD No. 1352. Northwestern University. April 20, 1943.
- M24** Protection afforded by ASC whetlerites of varying copper content. Surveillance of ASC whetlerites of varying copper content. (Informal Report No. 10.1-19.) Thurston Skei, Robert K. Brinton and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. June 10, 1943.
- M25** Reactions involving chromium which occur when ASC whetlerizing solution is in contact with charcoal. (Informal Report No. 10.1-17.) Francis E. Blacet, David H. Volman and George J. Doyle. OEMsr-282; Service Project No. CWS-7. Northwestern University. June 11, 1943.
- M26** An investigation of the possible explosion hazard presented by silver whetlerizing solutions and residues. (Progress Report to May 10, 1943.) Francis E. Blacet and David H. Volman. OEMsr-282; Service Project No. CWS-7; OSRD No. 1527. Northwestern University. June 21, 1943.
- M27** Additional study of the partial vapor pressures of the volatile constituents in whetlerizing solutions. (Progress Report to June 9, 1943.) Francis E. Blacet and David H. Volman. OEMsr-282; Service Project No. CWS-7; OSRD No. 1626. Northwestern University. July 3, 1943.
- M28** Analytical methods for whetlerites and whetlerizing solutions. (Informal Report No. 10.1-21.) Francis E. Blacet, Walter J. Blaedel and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. August 2, 1943.
- M29** Design and construction of the whetlerization pilot plant at the NDRC Division 10 Central Laboratory. R. J. Kunz, Jon C. Cooper and others. OEMsr-282; Service Project No. CWS-7; OSRD No. 1778. Northwestern University. September 6, 1943.
- M30** Determination of pyridine and ammonia in whetlerite and whetlerizing solutions. (Informal Report No. 10.1-44.) W. B. Lewis, Walter J. Blaedel and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. May 12, 1944.
- M31** The effect of air carbonization in the PCC charcoal process upon the whetlerite qualities of the adsorbent. Byron A. White, Clarence R. Bierman and others. OEMsr-282; Service Project Nos. CWS-7 and NS-338; OSRD No. 5115. Northwestern Technological Institute. May 24, 1945.
- M32** Magnetic studies on impregnated charcoal. Howard G. Cutforth, Irving M. Klotz and Francis E. Blacet. OEMsr-282; Service Project Nos. CWS-7 and NS-338; OSRD No. 5117. Northwestern Technological Institute. May 24, 1945.
- M33** The effect of impregnation on the removal of ethylene imine. Break times for di-, tri- and penta-methylene imines. (Informal Report No. LXX.) Philip A. Leighton. Stanford University. (n.d.)
- 202.141 Impregnating Agents**
- M1** [Absorbents for gas masks.] (Informal Report No. XXIII.) T. F. Young. University of Chicago. August 28, 1941.
- M2** Nature of the impregnant and new absorbents. (Informal Report No. XLVII.) H. F. Johnstone and George L. Clark. University of Illinois. December 5, 1941.

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- M3** Impregnation of charcoals with liquid ammonia, [Part] II. Impregnation of charcoals from vapor phase. (Informal Report No. LXI.) Francis E. Blacet. University of California at Los Angeles. December 22, 1941.
- M4** Study of impregnation. Iodic acid. (Informal Report No. LXIX.) J. C. Elgin. Princeton University. January 15, 1942.
- M5** Secondary impregnation of whetlerites with mercury compounds for the production of moisture-resistant SA catalysts. (Report No. 165.) Allan P. Colburn. NDCrc-70; Service Project Nos. CWS-7 and NL-B28; OSRD No. 362. University of Delaware. January 21, 1942.
- M6** Impregnated charcoals, by A. M. Patterson. *Chemical Warfare Monograph*, Volume 47, II Parts. Research Division, American University Experiment Station, June, 1919. ([Informal Report No.] XC.) Abstracted by: H. F. Johnstone. March, 1942.
- M7** A search for new reactants. (Report No. 216.) Francis E. Blacet. OEMsr-16; Service Project No. CWS-17; OSRD No. 472. University of California at Los Angeles. March 12, 1942.
- M8** Problems relating to CC. (Informal Report No. CXVII.) Wendell M. Latimer, H. W. Anderson and H. O. Kerlinger. University of California. May 15, 1942.
- M9** Preliminary study of hexamine impregnation. (Informal Report No. CXXII.) Francis E. Blacet and Jack G. Roof. Northwestern University. May 22, 1942.
- M10** The use of mercury compounds in the impregnation of activated charcoal. (Report No. 267.) Francis E. Blacet. OEMsr-282; Service Project No. CWS-7; OSRD No. 629. Northwestern University. May 25, 1942.
- M11** Iodine, halogen acids and their salts as charcoal impregnants. (Informal Report No. CLXIII.) Francis E. Blacet, Robert J. Grabenstetter and C. H. Simonson. Northwestern University. July 27, 1942.
- M12** One-step impregnation with whetlerizing solutions containing copper, silver and either molybdenum, vanadium or tungsten. (Informal Report No. CLXXVI, for the period [from] June 1 [to] August 5, 1942.) Francis E. Blacet and Robert J. Grabenstetter. OEMsr-282; Service Project No. CWS-7. Northwestern University. August 5, 1942.
- M13** Impregnation of activated charcoals to obtain high SA lives. (Report No. 355.) Allan P. Colburn, E. O. Kraemer and others. NDCrc-70; Service Project Nos. CWS-7 and NL-B28; OSRD No. 853. University of Delaware. September 1, 1942.
- M14** One-step impregnation with whetlerizing solutions containing copper, silver and chromium. (Informal Report No. CXCVI, for the period [from] June 11 to October 15, 1942.) Francis E. Blacet, Robert J. Grabenstetter and C. H. Simonson. OEMsr-282; Service Project No. CWS-7. Northwestern University. October 15, 1942.
- M15** One-step impregnation with copper, silver and either molybdenum, vanadium or zinc. (Informal Report No. CCXXV.) Francis E. Blacet, Robert J. Grabenstetter and C. H. Simonson. OEMsr-282; Service Project No. CWS-7. Northwestern University. November 10, 1942.
- M16** The use of copper, silver and chromium solutions as charcoal impregnants. (Second Report. Informal Report No. CCXXII.) Francis E. Blacet, Robert J. Grabenstetter and C. H. Simonson. OEMsr-282; Service Project Nos. CWS-7 and NL-B28. Northwestern University. December 21, 1942.
- M17** Picoline as impregnant for gas mask absorbents. (Progress Report to December 21, 1943.) Edwin O. Wiig, Herbert Scoville, Jr. and others. OEMsr-548; Service Project No. CWS-7; OSRD No. 3130. University of Rochester. January 15, 1944.
- M18** The state of impregnants on ASC charcoal. Magnetic susceptibility studies. (Informal Report No. 10.1-39.) Irving M. Klotz and Robert J. Grabenstetter. OEMsr-282; Service Project No. CWS-7. Northwestern University. January 28, 1944.
- M19** Miscellaneous impregnants. Robert J. Grabenstetter and Francis E. Blacet. OEMsr-282; Service Project Nos. CWS-7 and NS-338; OSRD No. 5277. Northwestern Technological Institute. June 29, 1945.
- 202.142 Drying Agents**
- M1** Drying agents for use with hopcalite. (Informal Report No. CXCI, for the period [from] August 15 to September 15, 1942.) Robert N. Pease. NDCrc-131; Service Project Nos. CWS-7 and NA-106. Princeton University. September 15, 1942.
- M2** Charcalite. A calcium chloride impregnated charcoal drying agent. (Progress Report to May 20, 1944.) Robert N. Pease and John H. McLean. NDCrc-131; Service Project No. NA-106 (3); OSRD No. 3776. Princeton University. June 15, 1944.
- M3** Further investigation of drying agents. (Progress Report to December 31, 1944.) Robert N. Pease and John H. McLean. NDCrc-131; Service Project Nos. NA-106(3), NS-338 and CWS-7; OSRD No. 4897. Princeton University. April 5, 1945.
- 202.143 X-ray and Microscopic Examination**
- M1** Comments on report by F. W. Matthews. Diffraction of X-rays by impregnated charcoal. (Part III of Canadian Report CE-21. [Informal Report No. X.] H. F. Johnstone. University of Illinois. August 12, 1941.
- M2** X-ray studies of various materials. Carbonization of resins. Electron microscope studies. Location of silver on silvered whetlerites and charcoals. The irreversible adsorption of As_2O_3 from alcohol by whetlerite. (Informal Report No. CXIII.) H. F. Johnstone, George L. Clark and others. University of Illinois. May 11, 1942.

- M3** X-ray studies of basic copper carbonate in whetlerites. X-ray studies of some hopcalites. X-ray studies on hexamethylene tetramine and NaOH treated charcoals and whetlerites. Preparation of charcoals from resins. (Informal Report No. CLXXVIII, for the period [from] July 15 to August 15, 1942.) H. F. Johnstone, George L. Clark and others. NDCrc-152; Service Project No. CWS-7. University of Illinois. August 15, 1942.
- M4** A study of impregnated charcoal by X-ray diffraction methods. (Report No. 468.) H. F. Johnstone and George L. Clark. NDCrc-152; Service Project Nos. CWS-7 and NL-B26; OSRD No. 1143. University of Illinois. December 9, 1942.
- M5** Application of the electron microscope to the study of charcoal. (Progress Report to June 1, 1943.) H. F. Johnstone and George L. Clark. OEMsr-599; Service Project No. CWS-7; OSRD No. 1686. University of Illinois. August 7, 1943.
- 202.15 Absorption Testing with Charcoal and Whetlerite**
- M1** [Metal carbonate impregnated charcoals.] (Informal Report No. XVIII.) Allan P. Colburn and E. O. Kraemer. University of Delaware. August 25, 1941.
- M2** [SA tube test methods.] (Informal Report No. XXII.) W. Conway Pierce. University of Chicago. August 26, 1941.
- M3** Some exploratory runs on the removal (adsorption) of H_2S by CWSN-10 and CWSN-19 TU-8 charcoals. (Informal Report No. XXIV.) Don M. Yost. California Institute of Technology. August 28, 1941.
- M4** The efficiency of charcoal toward chloracetophenone at low temperatures. (Informal Report No. XXIX.) Gregory P. Baxter. Harvard University. September, 1941.
- M5** Conclusions from investigations on the adsorption of SA and the distribution of the arsenic on the charcoal bed. (Informal Report No. XXXVI.) Edwin O. Wiig. University of Rochester. October 14, 1941.
- M6** Hydrogen cyanide and carbon monoxide. (Informal Report No. XXXVIII.) Robert N. Pease. Princeton University. October 15, 1941.
- M7** Electrical resistance and temperature of charcoals. (Report No. 205.) Malcolm Dole and Irving M. Klotz. NDCrc-109; Service Project No. CWS-7; OSRD No. 449. Northwestern University. December 13, 1941.
- M8** Adsorptions and surface areas of certain charcoals and whetlerites. (Informal Report No. LXVIII.) Paul H. Emmett. Johns Hopkins University. January 18, 1942.
- M9** Heat of wetting and apparent density. (Informal Report No. LXXV.) T. F. Young. University of Chicago. February 5, 1942.
- M10** Studies of CC and CNBR. (Informal Report No. LXXIX.) Wendell M. Latimer, W. H. Anderson and H. O. Kerlinger. University of California. February 15, 1942.
- M11** Adsorption and surface area measurements on whetlerites and charcoal samples. (Informal Report Nos. LXXXV, XCIV, CXXIII, CXXXIV, CLVI, CLXXIX, CXCIX, CCXVI and 10.1-1 for . . . March 15, April 15, May 15, June 15, July 15, August 15, October 16, November 16 and December 15, 1942.) Paul H. Emmett, H. A. Pohl and others. NDCrc-119; Service Project No. CWS-7. Johns Hopkins University.
- M12** The nature of the product desorbed from charcoal brought halfway to the breakpoint with chlorpicrin. (Informal Report No. C.) Gregory P. Baxter and H. H. Anderson. Harvard University. April 15, 1942.
- M13** Comparative AC retentivities of whetlerite and Type D mixture. (Informal Report No. XCV.) Edwin O. Wiig. University of Rochester. April 22, 1942.
- M14** Retentivity tests with hydrogen fluoride. (Informal Report No. CCVII, for the period [from] September 15 to October 10, 1942.) Roscoe G. Dickinson and Harold S. Johnston. NDCrc-137; Service Project Nos. CWS-7 and NL-B26. California Institute of Technology. October 10, 1942.
- M15** Testing charcoal fines by the Spotted Dick Test. (Informal Report No. 10.3A-4.) Don M. Yost, Richard W. Dodson and G. R. Leader. OEMsr-282; Service Project No. CWS-24. Northwestern University. January 15, 1943.
- M16** Adsorption and surface area measurements on whetlerite and charcoal samples. (Informal Report No. 10.4-26.) Paul H. Emmett, James Holmes and others. NDCrc-119; Service Project No. CWS-7. Johns Hopkins University. May 27, 1943.
- M17** Chemisorption of gases on charcoals and Type A whetlerites. (Informal Report No. 10.4-29.) Paul H. Emmett, H. A. Pohl and J. T. Kummer. NDCrc-119; Service Project No. CWS-7. Johns Hopkins University. July 8, 1943.
- M18** Adsorption and surface area measurements on whetlerites and charcoal samples. (Progress Report to May 15, 1943.) Paul H. Emmett. NDCrc-119; Service Project No. CWS-7; OSRD No. 1777. Johns Hopkins University. September 6, 1943.
- M19** Adsorption and surface area measurements on whetlerites and charcoal samples. (Formal Report covering the period [from] May 15, 1943 to November 15, 1944.) Paul H. Emmett, James Holmes and others. NDCrc-119; Service Project Nos. CWS-7 and NS-338; OSRD No. 5065. Johns Hopkins University. May 30, 1945.
- M20** The retentivity of charcoals. A study with methyl ethyl ether₄, neopentane and methanol. David H. Volman, George J. Doyle and Francis E. Blacet. OEMsr-282; Service Project Nos. CWS-7 and NS-338; OSRD No. 5236. Northwestern Technological Institute. June 21, 1945.
- M21** Summary of Lister's report. (Informal Report No.,

XII.) J. F. Kincaid. University of Rochester. (n.d.)

M22 Problem of gas removal. (Informal Report No. XV.) Louis S. Kassel. Universal Oil Products Company. (n.d.)

M23 Tests on absorption properties of charcoal. (Informal Report No. XXXII.) Roscoe G. Dickinson, Philip A. Leighton and others. (n.d.)

M24 Investigations on ad- and desorption processes in granular stream-penetrated beds of adsorbents, by E. Wicke (Göttingen). *Kolloid Zeitschrift*, 93, 129, 1940. (Informal Report No. XLVI.) Translated by: Malcolm Dole. Northwestern University. (n.d.)

M25 Substitutes for gas mask canister soda lime. (Informal Report No. LXIII.) G. Frederick Smith and Benjamin Gordon. (n.d.)

202.151 Absorbents (General Methods)

M1 A preliminary study of adsorbents. (Report No. 21.) H. F. Johnstone, Edwin O. Wiig and others. NDCrc-65, NDCrc-76 and others; Service Project No. CWS-7; OSRD No. 84. University of Chicago, University of Rochester and others. April 24, 1941.

M2 Summary of data on protection toward various gases. (Informal Report No. LXV.) W. Albert Noyes, Jr. University of Rochester. February 4, 1942.

M3 Studies of absorbents. (Informal Report No. LXXXVIII.) Philip A. Leighton. Stanford University. March 15, 1942.

M4 A preliminary study of the performance of double-layer absorbents. (Informal Report No. CLXXIV, for the period from July 15 to August 15, 1942.) W. Conway Pierce, J. William Zabor and Thurston Skei. OEMsr-282; Service Project No. CWS-7. Northwestern University. August 17, 1942.

M5 Interaction of hydrogen cyanide with various adsorbents. (Report No. 400.) Robert N. Pease. NDCrc-131; Service Project Nos. CWS-7 and NL-B26; OSRD No. 974. Princeton University. October 21, 1942.

M6 Gel-type hopcalite and some granular reagents for carbon monoxide. (Progress Report to December 31, 1944.) Robert N. Pease, George M. Brown and others. NDCrc-131; Service Project Nos. CWS-7, NA-106(3) and NS-338; OSRD No. 4895. Princeton University. April 5, 1945.

M7 Protection against two gases. (Informal Report No. XCVIII.) W. D. Walters. (n.d.)

202.152 Tests with Cyanogen Chloride and Cyanogen

M1 Cyanogen chloride. (Report No. 40.) Wendell M. Latimer. NDCrc-126; Service Project No. CWS-7; OSRD No. 102. University of California. June 16, 1941.

M2 Behavior of hopcalite, certain whetlerites, and some resins and whetlerite-soda lime mixtures toward cyanogen chloride. (Informal Report No. LXVI.) Wendell M. Latimer, H. W. Anderson and H. O.

Kerlinger. University of California. January 15, 1942.

M3 Cyanogen chloride (Part II. Report No. 168.) Wendell M. Latimer. NDCrc-126; Service Project No. CWS-7; OSRD No. 363. University of California. January 21, 1942.

M4 Stability of cyanogen chloride. Constants for various charcoals with cyanogen chloride. Preparation of cyanogen and nitrosyl chloride. (Report No. 244.) Wendell M. Latimer. NDCrc-126; Service Project No. CWS-7; OSRD No. 571. University of California. April 14, 1942.

M5 Adsorption of cyanogen by charcoal. Amine-impregnated charcoals. (Informal Report No. CXLIX.) Wendell M. Latimer, H. W. Anderson and H. O. Kerlinger. University of California. June 15, 1942.

M6 Studies of CC on absorbents. Stability of cyanogen; cyanogen in the effluent from AC tube tests. (Informal Report No. CLIV.) Wendell M. Latimer, H. W. Anderson and H. O. Kerlinger. University of California. July 14, 1942.

M7 Properties of cyanogen: toxicity, adsorption by charcoal, detection and estimation. (Informal Report No. CCVIII, for the period from September 1 to September 15, 1942.) Don M. Yost, Richard W. Dodson and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. September 15, 1942.

M8 Animal and chemical tests on cyanogen in effluent air stream after adsorption of HCN. (Report No. 447.) W. Conway Pierce, J. William Zabor and others. OEMsr-282; Service Project Nos. CWS-7 and NL-B26; OSRD No. 1090. Northwestern University. December 7, 1942.

M9 Preliminary tube tests with COClF. (Report No. 454.) Roscoe G. Dickinson. NDCrc-137; Service Project Nos. CWS-7 and NL-B26; OSRD No. 1106. California Institute of Technology. December 8, 1942.

M10 Aqueous hydrolysis of CNCl. (Progress Report to March 9, 1944.) Irving M. Klotz and W. Conway Pierce. OEMsr-282; Service Project No. CWS-7; OSRD No. 3461. Northwestern University. April 12, 1944.

202.153 Tests with Carbon Monoxide

M1 An exploratory study of carbon monoxide protection on charcoal and other carriers. (Informal Report No. 10.1-41.) George J. Doyle, David H. Volman and Francis E. Blacet. OEMsr-282; Service Project No. CWS-7. Northwestern University. February 7, 1944.

202.154 Tests with Arsine and Hydrogen Cyanide

M1 Investigations on the adsorption of hydrogen cyanide and arsine by charcoals. (Report No. 41.) Joseph W. Hickey, J. H. Raley and others. NDCrc-76; Service Project No. CWS-7; OSRD No. 103. University of Rochester. June 22, 1941.

M2 Osmium as a promoter for the catalytic removal

- of arsine by copper impregnated charcoals. (Informal Report No. XX.) Francis E. Blacet. University of California at Los Angeles. August 26, 1941.
- M3** [Impregnation with non-aqueous solutions for arsine and hydrogen cyanide absorption.] (Informal Report No. XXI.) Francis E. Blacet. University of California at Los Angeles. August 26, 1941.
- M4** Adsorption of HCN by various materials (Dr. Holmes). (Informal Report No. XIII.) Robert N. Pease. Princeton University. August 26, 1941.
- M5** Conclusions from results of investigations on the adsorption of hydrogen cyanide and arsine by impregnated charcoals. (Informal Report No. XXV.) Edwin O. Wiig. University of Rochester. August 29, 1941.
- M6** Hydrogen cyanide and arsine lives of equilibrated charcoals. (Informal Report No. XXX.) Edwin O. Wiig. University of Rochester. September 10, 1941.
- M7** Use of radioactive tracer technique for arsine removal. (Informal Report No. XXXIII.) Don M. Yost. California Institute of Technology. September 30, 1941.
- M8** Arsine removal by adsorbents. (Report No. 118.) W. Conway Pierce. NDCrc-65; Service Project Nos. CWS-7, NL-B26 and NL-B28; OSRD No. 180. University of Chicago. November 15, 1941.
- M9** Effect of intermittent versus continuous running on the SA life of copper whetlerite. (Informal Report No. XLII.) J. C. Elgin. Princeton University. November 19, 1941.
- M10** The use of gold chloride and potassium permanganate as arsine breakpoint indicators. (Report No. 143.) Edwin O. Wiig. NDCrc-76; Service Project No. CWS-7; OSRD No. 283. University of Rochester. December 18, 1941.
- M11** Removal of HCN by whetlerite. (Informal Report No. XLIX.) Robert N. Pease. Princeton University. December 29, 1941.
- M12** A brief investigation of removal of arsine in air-arsine mixtures by charcoal using the radioactive tracer method. (Report No. 156.) Don M. Yost. OEMsr-28; Service Project No. CWS-7; OSRD No. 361. California Institute of Technology. January 9, 1942.
- M13** Removal of HCN by whetlerite. Substitute absorbents. Pyrolysis of cotton cellulose. Protection against carbon monoxide. (Informal Report No. LXXX.) Robert N. Pease. Princeton University. February 15, 1942.
- M14** Removal of HCN by whetlerite. Pyrolysis of cotton cellulose. Protection against carbon monoxide. (Informal Report No. LXXXIV.) Robert N. Pease. Princeton University. March 15, 1942.
- M15** A study of the removal of arsine by whetlerite. (Report No. 209.) Edwin O. Wiig and Joseph W. Hickey. NDCrc-76; Service Project No. CWS-7; OSRD No. 462. University of Rochester. March 23, 1942.
- M16** Hydrogen cyanide removal by gas mask absorbent. (Report No. 220.) Edwin O. Wiig and J. H. Raley. NDCrc-76; Service Project No. CWS-7; OSRD No. 561. University of Rochester. April 6, 1942.
- M17** The effect of initial concentration on the arsine life. Arsine testing. (Informal Report No. XCVI.) Edwin O. Wiig. University of Rochester. April 15, 1942.
- M18** Studies on the reaction products of arsine on charcoal and whetlerite. (Informal Report No. CIII.) H. F. Johnstone and George L. Clark. University of Illinois. April 16, 1942.
- M19** Calorimetric studies on arsine removal. (Informal Report Nos. CXVI, CXXXII and CXC, for May 14, June 15 and September 15, 1942.) Hugh M. Huffman, John B. Hatcher and others. OEMsr-199; Service Project No. CWS-7. California Institute of Technology.
- M20** Mechanism of removal of HCN by whetlerite. (Informal Report No. CXV.) Robert N. Pease. Princeton University. May 15, 1942.
- M21** Effect of water upon the removal of arsine by whetlerite. (Report No. 246.) Edwin O. Wiig and Herbert Scoville, Jr. NDCrc-76; Service Project No. CWS-7; OSRD No. 594. University of Rochester. May 20, 1942.
- M22** A study of the poisoning of various absorbents toward arsine by hydrogen cyanide. (Report No. 255.) Edwin O. Wiig. NDCrc-76; Service Project Nos. CWS-7 and NL-B28; OSRD No. 628. University of Rochester. June 6, 1942.
- M23** Arsine and hydrogen cyanide. (Report No. 291.) Edwin O. Wiig. NDCrc-76; Service Project Nos. CWS-7 and NL-B28; OSRD No. 710. University of Rochester. July 1, 1942.
- M24** Cyanogen in effluent air stream after the absorption of HCN by whetlerites. (Informal Report No. CL.) Edwin O. Wiig, L. V. McCarty and others. University of Rochester. July 15, 1942.
- M25** A study of HCN and (CN)₂ concentrations in the effluent from various absorbents exposed to HCN under several conditions. Lowering the vapor pressure of arsine. (Informal Report No. CLXXV.) Edwin O. Wiig, L. V. McCarty and others. NDCrc-76; Service Project No. CWS-7. University of Rochester. August 15, 1942.
- M26** The absorption of HCN by whetlerite and other absorbents. (Informal Report No. CLXXXIV.) Edwin O. Wiig, L. V. McCarty and others. Service Project No. CWS-7. University of Rochester. September 15, 1942.
- M27** Protection against cyanogen. (Informal Report No. CLXXXVII, for the period [from] August 15 to September 15, 1942.) Wendell M. Latimer, H. W. Anderson and H. O. Kerlinger. NDCrc-126; Service Project Nos. CWS-7 and NL-B28. University of California. September 15, 1942.
- M28** The absorption of HCN, C₂N₂ and SA by whetlerite and other absorbents. The effect of temperature on the HCN life of whetlerite. Desorption

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and recovery of absorbents after absorption of HCN and C_2N_2 . (Informal Report No. CCIH, for the period [from] September 15 to October 15, 1942.) Edwin O. Wiig, Herbert Scoville, Jr. and others. OEMsr-548. University of Rochester. October 15, 1942.

M29 The removal of HCN and C_2N_2 by absorbents. (Informal Report No. CCXVIII, for the period [from] October 15 to November 15, 1942.) Edwin O. Wiig, Herbert Scoville, Jr. and others. OEMsr-548; Service Project No. CWS-7. University of Rochester. November 23, 1942.

M30 Variation of HCN life with layer depth for Type ASC whetlerite. The effect of particle size on the C_2N_2 life. (Informal Report No. 10.1-2, for the period [from] November 15 to December 15, 1942.) Edwin O. Wiig, Herbert Scoville, Jr. and others. OEMsr-548; Service Project No. CWS-7. University of Rochester. December 21, 1942.

M31 Summary of a review on hydrogen cyanide, cyanogen and cyanogen chloride removal by gas mask absorbents. Edwin O. Wiig. OEMsr-548; Service Project No. CWS-7; OSRD No. 1268. University of Rochester. March 17, 1943.

202.155 Tests with Phosgene and Chlorpicrin

M1 A study of the penetration of charcoal by chlorpicrin by means of the ultraviolet photometer. (Informal Report No. LXIV.) Malcolm Dole and Irving M. Klotz. Northwestern University. December 13, 1941.

M2 Phosgene and mustard gas removal. (Informal Report No. LXXI.) Don M. Yost, Richard W. Dodson and Don S. Martin, Jr. California Institute of Technology. January 26, 1942.

M3 Removal of chlorpicrin and the nature of its desorption product. The removal of chloracetophenone as a smoke at low temperatures. (Report No. 290.) Gregory P. Baxter and H. H. Anderson. NDCrc-112; Service Project No. CWS-7; OSRD No. 703. Harvard University. July 1, 1942.

M4 Adsorption studies on chlorpicrin and phosgene. (Report No. 383.) Malcolm Dole and Irving M. Klotz. NDCrc-109; Service Project Nos. CWS-7 and NL-B26; OSRD No. 972. Northwestern University. July 15, 1942.

M5 An investigation of the mechanism of removal of phosgene from phosgene-air mixtures by charcoal, using the radioactive tracer method. (Report No. 372.) Don M. Yost. OEMsr-28; Service Project Nos. CWS-7 and NL-B26; OSRD No. 903. California Institute of Technology. September 25, 1942.

202.156 Tests with Other Gases and Agents

M1 [Removal of war gases.] Report on the activities of Section L-11. ([Informal Report No.] III.) (n.a.) April 25, 1941.

M2 Methods of studying the removal of selenium hexafluoride. (Report No. 42.) Roscoe G. Dickinson,

Arthur J. Stosick and John W. Otvos. NDCrc-137; Service Project No. CWS-7; OSRD No. 104. California Institute of Technology. June 27, 1941.

M3 Removal of EN. (Informal Report No. XIX.) Philip A. Leighton. Stanford University. August 26, 1941.

M4 Preliminary examination of [Compound] 1120 removal. (Report No. 142.) Roscoe G. Dickinson. NDCrc-137; Service Project No. CWS-7; OSRD No. 300. California Institute of Technology. December 18, 1941.

M5 Removal of chloracetophenone at low temperatures. (Informal Report No. LIX.) Gregory P. Baxter. Harvard University. December 29, 1941.

M6 The removal of hexamethylene diamine. (Report No. 153.) Philip A. Leighton. NDCrc-122; Service Project No. CWS-7; OSRD No. 304. Stanford University. January 7, 1942.

M7 Summary of protection data on ethylene imine. (Informal Report No. LXXII.) Philip A. Leighton. Stanford University. January 23, 1942.

M8 Phosphorus trifluoride removal by whetlerite and by soda lime-whetlerite admixtures. (Report No. 232.) Roscoe G. Dickinson, Arthur J. Stosick and John W. Otvos. NDCrc-137; Service Project No. CWS-7; OSRD No. 533. California Institute of Technology. April 6, 1942.

M9 Protection against carbon monoxide at low concentrations. Removal of hydrogen cyanide by whetlerite. (Informal Report No. XCII.) Robert N. Pease. Princeton University. April 15, 1942.

M10 EN. Polymerization; thermal effects; effect of oxygen; effect of drying; miscellaneous gases, especially amines. (Informal Report No. CVI [for the period] from December 30, 1942 to April 15, 1942.) Philip A. Leighton. Stanford University. April 15, 1942.

M11 The absorption of PS and CG. (Informal Report No. XCIII.) Malcolm Dole and Irving M. Klotz. Northwestern University. April 15, 1942.

M12 Comparative retentivities of whetlerite and Type D mixture for SeF_6 and for 1120. (Report No. 262.) Roscoe G. Dickinson, John W. Otvos and Arthur J. Stosick. NDCrc-137; Service Project No. CWS-7; OSRD No. 616. California Institute of Technology. May 9, 1942.

M13 The effect of hexane vapor on SA and AC lives of CWSE-1 TE-1 and Type D mixture. (Informal Report No. CXXVI.) Edwin O. Wiig. University of Rochester. May 28, 1942.

M14 Behavior of sulfur dioxide and of several other gases on whetlerite. (Informal Report No. CXXXVII.) Philip A. Leighton. Stanford University. June 15, 1942.

M15 Calorimetric studies on the removal of SA. (Informal Report No. CXCVIII, for the period from September 15 to October 15, 1942.) Hugh M. Huffman, John B. Hatcher and G. B. Guthrie. OEMsr-199; Service Project No. CWS-7. California Institute of Technology. October 15, 1942.

- M16** Preliminary tube tests with COClF. (Informal Report No. CCVI, for the period [from] September 15 to October 15, 1942.) Roscoe G. Dickinson and John W. Otvos. NDCrc-137; Service Project Nos. CWS-7 and NL-B26. California Institute of Technology. October 21, 1942.
- M17** Retentivity tests with hydrogen fluoride. (Report No. 449.) Roscoe G. Dickinson. NDCrc-137; Service Project Nos. CWS-7 and NL-B26; OSRD No. 1072. California Institute of Technology. December 8, 1942.
- M18** Action of nitrogen dioxide on activated charcoals, whetlerites and other substances. (Informal Report No. 10.1-20.) Francis E. Blacet, Walter J. Blaedel and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. June 25, 1943.
- M19** Diffusion coefficients and molecular radii of PS, CG, AC and CC. (Informal Report No. 10.1-55.) Irving M. Klotz, Daniel K. Miller and Francis E. Blacet. OEMsr-282; Service Project No. CWS-7. Northwestern University. October 14, 1944.
- M20** Critical bed depths in removal of CC by the E-3, or M-11, canister. Critical bed depths and mechanisms of removal of six gases. Irving M. Klotz, Warren L. McCabe and others. OEMsr-282; Service Project Nos. CWS-7 and NS-338; OSRD No. 5239. Northwestern Technological Institute. June 7, 1945.
- M21** Brief summary of information relative to the mechanisms of removal of various war gases. (Informal Report No. XXXI.) (n.a.) (n.d.)
- M22** The removal of EN. (Informal Report No. LX.) Philip A. Leighton. Stanford University. (n.d.)
- 202.157 Adsorption Wave**
- M1** Study of adsorption wave. (Informal Report No. XXVIII.) J. C. Elgin. Princeton University. August 30, 1941.
- M2** Notes on the Kassel report. (Informal Report No. XVI.) J. F. Kincaid. University of Rochester. September 16, 1941.
- M3** Adsorption waves studies. (Informal Report No. LVI.) J. C. Elgin. Princeton University. December 22, 1941.
- M4** The adsorption of CG. (Informal Report No. CXI.) Malcolm Dole and Sol W. Weller. Northwestern University. May 15, 1942.
- M5** Study of the adsorption wave. (Informal Report Nos. CXXVII, CXXVII-A and CLXIX.) J. C. Elgin, R. H. Wilhelm and J. C. Whitwell. Princeton University. May 15, July 1 and July 16, 1942.
- M6** Studies of the adsorption wave for PS on carbon. (Report No. 467.) J. C. Elgin, R. H. Wilhelm and others. NDCrc-108; Service Project Nos. CWS-7 and NL-B26; OSRD No. 1133. Princeton University. December 9, 1942.
- M7** Studies of the adsorption wave on two types of charcoal. (Report to December 15, 1943.) R. H. Wilhelm, J. C. Whitwell and S. F. Williams. NDCrc-108; Service Project No. CWS-7; OSRD No. 3320. Princeton University. March 4, 1944.
- M8** The adsorption wave. Study of the adsorption wave. Plotting of the Schumann-Furnas graphs for low values of the concentration. (Informal Report No. 10.5-48.) F. B. Drew, F. M. Spooner and Jesse Douglas. OEMsr-349. Columbia University. November 17, 1944.
- 202.16 Aging and Deterioration of Charcoal and Whetlerite**
- M1** [Life tests of AsH₃ and HCN.] (Informal Report No. IX.) H. F. Johnstone. August 8, 1941.
- M2** The deterioration of thiocyanate whetlerites. (Report No. 70.) Wendell M. Latimer. NDCrc-126; Service Project No. CWS-7; OSRD No. 132. University of California. September 8, 1941.
- M3** The effect of concentration and temperature on the AC life of standard whetlerite. (Report No. 203.) Edwin O. Wiig. NDCrc-76; Service Project No. CWS-7; OSRD No. 448. University of Rochester. February 19, 1942.
- M4** Variation of SA life with temperature. Poisoning of AC toward SA lives. (Informal Report No. LXXXIII.) Edwin O. Wiig. University of Rochester. March 15, 1942.
- M5** Summary of test data on E-6 whetlerite. (Informal Report No. CIX.) W. Conway Pierce and J. William Zabor. Northwestern University. May 9, 1942.
- M6** Efficiency of whetlerite containing considerable proportions of water against chlorpicrin. (Informal Report No. CXII.) Gregory P. Baxter and H. H. Anderson. Harvard University. May 15, 1942.
- M7** The effect of various vapors on the SA life of absorbents. A continuation of the study of the effect of AC on the SA life and the effect of SA on the AC life of absorbents. Variation of SA life with relative humidity for dry and equilibrated whetlerites. (Informal Report No. CXXVIII.) Edwin O. Wiig, L. V. McCarty and others. University of Rochester. June 15, 1942.
- M8** Comparison of the effect of water, AC and other poisons on the SA lives of silvered and of unsilvered whetlerites. (Informal Report No. CLI.) Edwin O. Wiig, L. V. McCarty and others. University of Rochester. July 15, 1942.
- M9** The effect of organic vapors on service lives of whetlerites and Type D mixtures. (Report No. 304.) Roscoe G. Dickinson, Don M. Yost and others. NDCrc-137, OEMsr-282 and others; Service Project Nos. CWS-7 and NL-B26; OSRD No. 759. California Institute of Technology, Northwestern University and others. July 15, 1942.
- M10** Variation of the CG life of various humidified adsorbents with decreasing temperature. (Report No. 434.) W. Conway Pierce. OEMsr-282; Service Project Nos. CWS-7 and NL-B26; OSRD No. 1055. Northwestern University. November 26, 1942.
- M11** Surveillance of whetlerites. (Informal Report No. 10.1-10.) Francis E. Blacet and Robert J. Graben-

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- stetter. OEMsr-282; Service Project No. CWS-7. Northwestern University. April 5, 1943.
- M12** CG aging for Type AS and ASC whetlerites. Fourth comparison chart. (Progress Report to June 25, 1943.) Francis E. Blacet and W. Conway Pierce. OEMsr-282; Service Project No. CWS-7; OSRD No. 1691. Northwestern University. August 6, 1943.
- M13** The surveillance of base charcoals. (Informal Report No. 10.1-25.) Francis E. Blacet, Robert J. Grabenstetter and C. H. Simonson. OEMsr-282; Service Project No. CWS-7. Northwestern University. August 10, 1943.
- M14** The aging of ASC whetlerite under various atmospheres in sealed systems. (Informal Report No. 10.1-29.) Francis E. Blacet, Jack G. Roof and J. N. Pitts. Service Project No. CWS-7. Northwestern University. September 22, 1943.
- M15** Surveillance of Types ASC and ASCM whetlerites. (Progress Report to July 12, 1943.) Edwin O. Wiig, Herbert Scoville, Jr. and others. OEMsr-548; Service Project No. CWS-7; OSRD No. 1873. University of Rochester. October 1, 1943.
- M16** Accelerated aging studies. (Study Nos. III to IX, for December 15, 1943, January 15, February 15, March 15, April 15, June 15 and August 15, 1944.) Thurston Skei, Carolyn Palmer and others. Northwestern University.
- M17** Compilation of N_0 and λ_c values for miscellaneous whetlerites before and after aging. (Progress Report to July 10, 1944.) David B. Ehrlinger, Louis C. Weiss and others. OEMsr-282; Service Project No. CWS-7; OSRD No. 4013. Northwestern University. August 12, 1944.
- M18** Leaching and rewhetlerization; their effect on whetlerite quality. (Informal Report No. 10.1-54.) Louis C. Weiss, Helen Waggoner and others. Service Project No. CWS-7. Northwestern University. September 18, 1944.
- M19** Surveillance tests on ASC, E-11 and E-13 whetlerites. Thurston Skei, J. B. Fehrenbacher and others. OEMsr-282; Service Project No. CWS-7; OSRD No. 4232. Northwestern University. October 12, 1944.
- M20** Surveillance studies on whetlerites at Northwestern University. A summary of work from 1942 [to] 1944. (Progress Report to September 30, 1944.) Thurston Skei. OEMsr-282; Service Project No. CWS-7; OSRD No. 4346. Northwestern University. November 15, 1944.
- M21** Surveillance of ASC-Ni whetlerites with CK. Robert J. Grabenstetter and Francis E. Blacet. OEMsr-282; Service Project Nos. CWS-7 and NS-338; OSRD No. 5114. Northwestern Technological Institute. May 24, 1945.
- 202.17 Humidification Tests with Charcoal and Whetlerite**
- M1** Sorption time data for water vapor on whetlerite. (Informal Report No. LXXXVII.) Allan P. Colburn. University of Delaware. March 16, 1942.
- M2** X-ray studies. Humidified charcoals at low temperature; silvered and E-6 whetlerites. (Informal Report No. LXXXIX.) H. F. Johnstone and George L. Clark. University of Illinois. April 9, 1942.
- M3** The rate of water absorption of charcoals and whetlerites. (Informal Report No. CI.) Allan P. Colburn. University of Delaware. April 15, 1942.
- M4** Variation of SA life with relative humidity for equilibrated charcoals. (Informal Report No. CVII.) Edwin O. Wiig, L. V. McCarty and others. University of Rochester. May 15, 1942.
- M5** Rate of humidification of charcoals and whetlerites. (Informal Report No. CXXXIII.) Allan P. Colburn. University of Delaware. June 17, 1942.
- M6** Effect of moisture on SA, AC and CC tube lives two Type ASC whetlerites. (Informal Report No. CCXXI.) Francis E. Blacet and Thurston Skei. OEMsr-282; Service Project Nos. CWS-7 and NL-B28. Northwestern University. December 10, 1942.
- M7** An accelerated flow method for humidifying small samples of adsorbents for plant control tests. (Informal Report No. 10.1-9.) W. Conway Pierce, J. William Zabor and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. April 3, 1943.
- M8** The aging of ASC and ASCP whetlerite containing various amounts of water in sealed systems. (Informal Report No. 10.1-36.) Francis E. Blacet, Jack G. Roof and J. N. Pitts. OEMsr-282; Service Project No. CWS-7. Northwestern University. November 12, 1943.
- M9** Water isotherms and rates of adsorption and desorption of water upon base charcoals and whetlerites. Macro-pore measurements by the Pearson gage and mercury penetration techniques. (Progress Report to November, 1944.) Paul H. Emmett, James Holmes and others. NDCrc-119; Service Project Nos. CWS-7 and NS-338; OSRD No. 4959. Johns Hopkins University. April 20, 1945.
- 202.18 Particle Size of Charcoal and Whetlerite**
- M1** Mesh size and arsine saturation value. (Informal Report No. XLI.) W. Conway Pierce. University of Chicago. November 10, 1941.
- M2** The effect of particle size on the SA and AC lives and on the resistance of the charcoal bed. (Report No. 119.) Edwin O. Wiig. NDCrc-76; Service Project No. CWS-7; OSRD No. 181. University of Rochester. November 17, 1941.
- M3** The effect of particle size on the SA lives of equilibrated charcoals. (Informal Report No. LI.) Edwin O. Wiig. University of Rochester. December 17, 1941.
- M4** The effect of primary particle size in the processing of Pittsburgh Coke and Chemical Company type charcoal. Byron A. White, Clarence R. Bierman and others. OEMsr-282; Service Project Nos. CWS-7 and NS-338; OSRD No. 5234. Northwestern Technological Institute. June 21, 1945.

202.19 Miscellaneous Tests with Charcoal and Whetlerite

- M1** Diffusion as the limiting factor for critical bed lengths. (Informal Report No. CXLV.) Malcolm Dole and Irving M. Klotz. June 25, 1942.
- M2** Suggested field laboratory method of testing permeable fabrics for resistance to penetration by mustard vapor. (Informal Report No. 10.3A-5.) Don M. Yost, Richard W. Dodson and G. R. Leader. OEMsr-282; Service Project No. CWS-24. Northwestern University. January 15, 1943.
- M3** Study of the partial vapor pressures of the volatile constituents in whetlerizing solutions. (Progress Report to March 19, 1943.) Francis E. Blacet and David H. Volman. OEMsr-282; Service Project No. CWS-7; OSRD No. 1351. Northwestern University. April 20, 1943.
- M4** Reclamation of Type A whetlerite. (Informal Report No. 10.5-23.) Edward H. Conroy, R. J. Kunz and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. March 9, 1944.
- M5** The effect of backfeeding on the quality of ASC whetlerite. (Informal Report No. 10.5-30.) Edward H. Conroy, R. J. Kunz and others. OEMsr-282; Service Project No. CWS-7. Northwestern University. May 6, 1944.

202.2 Other Absorbents and Catalysts

- M1** Substitutes for gas mask absorbents. The use of wyolite as an inert carrier for absorbents. (Informal Report Nos. XLIII, LXXXII, XCVII, CXXV and CXXXIX.) G. Frederick Smith. University of Illinois. November 27, 1941, February 10, April 15, May 15 and June 15, 1942.
- M2** The value of soda lime in gas absorbents. (Report No. 198.) W. Conway Pierce, Edwin O. Wiig and others. OEMsr-282, NDCrc-76 and others; Service Project No. CWS-7; OSRD No. 437. Northwestern University, University of Rochester and others. March 6, 1942.
- M3** Protection against carbon monoxide. (Informal Report Nos. CXIV and CXLII.) Robert N. Pease. Princeton University. May 15 and June 15, 1942.
- M4** A summary of tests on soda lime. (Report No. 401.) W. Conway Pierce. OEMsr-282; Service Project Nos. CWS-7 and NL-B26; OSRD No. 970. Northwestern University. October 21, 1942.
- M5** Carbon monoxide removal. (Monthly Reports for the period from July 15, 1943 to January 15, 1944.) Robert N. Pease, John H. McLean and others. NDCrc-131. Princeton University.
- M6** Catalysts for the oxidation of carbon monoxide in air. (Progress Report to July 1, 1943.) Robert N. Pease, Nat C. Robertson and W. J. Shelburne, Jr. NDCrc-131; Service Project No. CWS-7; OSRD No. 3071. Princeton University. January 4, 1944.
- M7** Carbon monoxide removal and drying agents. (Monthly Reports for . . . March 15, June 15(?), July 15 and August 15, 1944.) Robert N. Pease, George M. Brown and others. NDCrc-131. Princeton University.

- M8** Protection against carbon monoxide. (Final Report to December 31, 1944.) Robert N. Pease. NDCrc-131; Service Project Nos. NA-106(3), NS-338 and CWS-7; OSRD No. 4898. Princeton University. April 5, 1945.

202.21 Resins

- M1** Summary of information on resins to April 18, 1942. Aminated phenol-formaldehyde xerogels as absorbents. (Informal Report No. CXXXVIII.) Philip A. Leighton. Stanford University. June 15, 1942.
- M2** Further studies on the characteristics and impregnation of aminated phenol-formaldehyde xerogels. (Informal Report No. CCXI, for the period from June 1 to September 1, 1942.) Philip A. Leighton and S. W. Grinnell. NDCrc-122; Service Project Nos. CWS-7 and NL-B28. Stanford University. November 15, 1942.
- M3** Preparation and use of amine resins for gas adsorption. (Informal Report Nos. 10.4-1 and -10.) Gordon F. Mills. OEMsr-676; Service Project No. NL-B28. Chemical Process Company. December 17, 1942 and February 10, 1943.
- M4** Studies of adsorbent resins. (Informal Report No. 10.4-5.) Gordon F. Mills. OEMsr-676; Service Project Nos. NL-B28 and CWS-7. Chemical Process Company. January 15, 1943.
- M5** Development of amine resin adsorbents for gas adsorption and other purposes. (Informal Report Nos. 10.4-12 and -17, for the period from February 10 to April 11, 1943.) Gordon F. Mills. OEMsr-676; Service Project No. NL-B28. Chemical Process Company. March 11 and April 13, 1943.
- M6** Use of aminated phenol-formaldehyde xerogels as gas adsorbents. Gordon F. Mills. OEMsr-676; Service Project Nos. CWS-7 and NL-B28; OSRD No. 1771. Chemical Process Company. September 4, 1943.
- M7** Use of amine resins as gas adsorbents. (Informal Report No. 10.4-46.) Gordon F. Mills. OEMsr-676; Service Project No. CWS-7. Chemical Process Company. January 20, 1944.
- M8** Use of aminated phenol-formaldehyde xerogels as gas adsorbents. (Report to June 28, 1944.) Gordon F. Mills and B. N. Dickinson. OEMsr-676; Service Project Nos. CWS-7 and NL-B28; OSRD No. 3975. Chemical Process Company. August 4, 1944.

203**Rebreather**

- M1** Nitrogen elimination in high-altitude rebreather. (Informal Report Nos. 10.3B-6, -10, -19, -20, -23 and -27.) Don M. Yost, Don S. Martin, Jr. and others. OEMsr-282; Service Project No. NA-106(4). Northwestern University. January 15, February 15, April 15, May 5, June 15 and July 15, 1943.
- M2** Nitrogen elimination in Navy high-altitude rebreather. (Informal Report Nos. 10.3B-29; 10.1-30, -33 and -35.) Don M. Yost, Don S. Martin, Jr. and others. OEMsr-282; Service Project No. NA-

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106(4). Northwestern University. July 15, September 15, October 15 and November 15, 1943.

- M3** Development and testing of a pump-type autovent for nitrogen elimination in Navy high-altitude rebreather. (Report to March 1, 1944.) Don S. Martin, Jr., J. E. Seegmiller and others. [OEMsr-282;] OSRD No. 3463. [Northwestern University.] April 12, 1944.

300 METEOROLOGICAL EXPERIMENTATION

- M1** Division 10 meeting [at] Northwestern Technological Institute, April 20 and 21, 1943. Part I, Conference on meteorology and chemical warfare. Part II, Protection problems, smoke generators and development problems. W. D. Walters and M. T. O'Shaughnessy. [April, 1943.]
- M2** Division 10 meeting [at] National Academy of Sciences, June 28 and 29, 1943. Part I, Conference on practical aspects of Division 10 work in relation to chemical warfare. Part II, Review of the recent work of Division 10. (n.a.) [June, 1943.]
- M3** Bibliography on micrometeorology, 1927 to 1943. As a supplement to the bibliography in Geiger's *Klima der bodennahen luftschicht*. Irving M. Klotz, Jeanne Colbert and George J. Doyle. OEMsr-282. Northwestern University. November 15, 1943.

301 Meteorological Experimental Instruments

- M1** Meteorological instruments. (Informal Report No. 10.3A-6, for the period [from] January 15 to February 15, 1943.) Wendell M. Latimer, Samuel Ruben and others. NDCrc-126; Service Project No. CWS-26. University of California. February 15, 1943.
- M2** Meteorological instruments. Observations in the field. (Informal Report No. 10.3A-14, covering the period [from] February 15 to April 15, 1943.) Wendell M. Latimer, Samuel Ruben and others. NDCrc-126; Service Project No. CWS-26. University of California. April 15, 1943.
- M3** Some instruments used by Division 10, NDRC, at Dugway Proving Ground for the continuous recording of micrometeorological conditions. S. W. Grinnell. OEMsr-282, OEMsr-861 and NDCrc-122; Service Project No. CWS-26; OSRD No. 6088. Northwestern Technological Institute, California Institute of Technology and Stanford University. October 15, 1945.
- M4** Portable instruments for use in the study of micrometeorology and microclimatology of the Southwest Pacific Area. (Progress Report to August 1, 1945.) Robert L. Mills and Roscoe G. Dickinson. NDCrc-137; Service Project No. CWS-26; OSRD No. 6174. California Institute of Technology. October 18, 1945.

301.1 Anemometer

- M1** A comparison of three types of cup anemometer at low velocities. (Informal Report No. 10.3A-38.)

Roscoe G. Dickinson and Harold S. Johnston. NDCrc-137; Service Project No. CWS-26. California Institute of Technology. October 26, 1943.

- M2** A remote indicating cup anemometer with magnetic coupling. (Progress Report to April 10, 1944.) Roscoe G. Dickinson and Douglas L. Kraus. NDCrc-137 and OEMsr-861; Service Project No. CWS-26; OSRD No. 3714. California Institute of Technology. May 30, 1944.

301.11 Vanes

- M1** Meteorological instruments. Wind velocity measurements. (Informal Report No. 10.3A-1.) Don M. Yost, Richard W. Dodson and others. OEMsr-282; Service Project No. CWS-26. Northwestern University. December 15, 1942.
- M2** A short photographic record of the motion of a bi-directional vane. (Informal Report No. 10.3A-29.) Richard W. Dodson and Louis G. Stang. OEMsr-861; Service Project No. CWS-26. California Institute of Technology. August 12, 1943.
- M3** Graphically recording bi-directional vanes. (Informal Report No. 10.3A-40.) Don M. Yost, Richard W. Dodson and others. OEMsr-861; Service Project No. CWS-26. California Institute of Technology. November 1, 1943.
- M4** A mercury contact wind direction vane. (Progress Report to December 31, 1944.) Roscoe G. Dickinson, Robert L. Mills and Harold S. Johnston. NDCrc-137; Service Project No. CWS-26; OSRD No. 6173. California Institute of Technology. October 18, 1945.

301.2 Temperature Profile

- M1** Experiments on the measurement of air temperatures with thermocouples. (Informal Report No. 10.3A-26.) Don M. Yost, John B. Hatcher and Rene Scott. OEMsr-861; Service Project No. CWS-26. California Institute of Technology. July 20, 1943.
- M2** Thermocouple experiments. (Informal Report No. 10.3A-32.) Don M. Yost, John B. Hatcher and Rene Scott. OEMsr-861; Service Project No. CWS-26. California Institute of Technology. August 27, 1943.
- M3** An apparatus for temperature profile measurement. (Informal Report No. 10.3A-45.) Roscoe G. Dickinson, Robert L. Mills and Harold S. Johnston. NDCrc-137; Service Project No. CWS-26. California Institute of Technology. April 11, 1944.

302 Meteorological Field Tests

- M1** Temperature gradients and R values in relation to the smoke conditions in the Salt Lake Valley. (Informal Report No. 10.3A-17.) M. D. Thomas. American Smelting and Refining Company. April 17, 1943.

302.1 Gas and Smoke Cloud Movements

- M1** Wind velocities and gustiness. (Informal Report No. CCXII, for the period [from] October 15 to November 15, 1942.) Don M. Yost. Service Project No. CWS-7. Northwestern University. November 15, 1942.
- M2** Movement of smoke in the atmosphere. (Informal Report No. 10.3A-2.) F. T. Wall. University of Illinois. January 14, 1943.
- M3** Meteorological observations made during United States Army smoke tests at Sault Ste. Marie, Michigan, December 28 [to] 30, 1942. (Informal Report No. 10.3A-3.) Richard W. Dodson, J. S. Gilman and others. OEMsr-282; Service Project No. CWS-26. Northwestern University. January 15, 1943.
- M4** Micrometeorological measurements made during the smoke screening tests at the Portsmouth, Virginia, Navy Yard on February 3 and 8, 1943. (Informal Report No. 10.3A-10.) Don M. Yost, T. S. Gilman and Philip Hayward. OEMsr-282; Service Project No. CWS-26. [Northwestern University.] February 15, 1943.
- M5** Meteorological observations in connection with the study of smokes and gases. (Informal Report No. 10.3A-15, covering period [from] March 11 to April 10, 1943.) H. F. Johnstone and Paul G. Roach. OEMsr-599; Service Project Nos. CWS-1 and CWS-26. University of Illinois. April 16, 1943.
- M6** Tabulations of data on concentrations in gas clouds under various meteorological conditions. (Informal Report No. 10.3A-20.) Wendell M. Latimer. NDCrc-126; Service Project No. CWS-26. University of California. June 10, 1943.
- M7** The preliminary investigation of the micrometeorological conditions at Rancho Grande, California. (Informal Report No. 10.3A-27.) Don M. Yost, Douglas L. Kraus and others. OEMsr-861; Service Project No. CWS-26. California Institute of Technology. June 18, 1943.
- M8** Micrometeorological observations at United States Army smoke tests in the Los Angeles area, March 17, 18 and 19 and April 20, 1943. (Progress Report to May 3, 1943.) Harold S. Johnston, Roscoe G. Dickinson and others. NDCrc-137; Service Project No. CWS-26; OSRD No. 1526. California Institute of Technology. June 19, 1943.
- M9** Some observations at Rosamond Dry Lake on parameters used in the treatment of gas and smoke clouds. (Informal Report No. 10.3A-19.) Roscoe G. Dickinson, Harold S. Johnston and others. Service Project No. CWS-26. [California Institute of Technology.] June 21, 1943.
- M10** Large-scale screening tests [at] Camp Sibert, Alabama, May 4 [to] 7, 1943. W. H. Rodebush, H. F. Johnstone and others. OEMsr-108 and OEMsr-599; Service Project No. CWS-1; OSRD No. 1687. University of Illinois. August 10, 1943.
- M11** Smoke experiments carried out at Camp Sibert, Alabama. (Progress Report to May 15, 1943.) T. S. Gilman and Philip Hayward. OEMsr-861; Service Project No. CWS-26; OSRD No. 1712. California Institute of Technology. August 14, 1943.
- M12** Experiments at the Rancho Grande, July 28 and 29, 1943, on the "doughnut" effect and the influence of terrain on the flow of gas clouds. (Informal Report No. 10.3A-28.) Lindsay Helmholtz, John B. Hatcher and others. OEMsr-861; Service Project No. CWS-26. California Institute of Technology. August 22, 1943.
- M13** Measurements on the widths of smoke clouds. (Informal Report No. 10.3A-30.) Richard W. Dodson, Lindsay Helmholtz and others. OEMsr-861; Service Project No. CWS-26. California Institute of Technology. August 25, 1943.
- M14** Concentrations in gas clouds under high-inversion conditions. (Progress Report to July 14, 1943.) Wendell M. Latimer and Samuel Ruben. OEMsr-861 and NDCrc-126; Service Project No. CWS-26; OSRD No. 1749. California Institute of Technology and University of California. August 31, 1943.
- M15** Scale model studies of the movement of smoke and gas clouds. (Informal Report No. 10.3A-36.) Hunter Rouse. OEMsr-599; Service Project No. CWS-26. State University of Iowa. October 10, 1943.
- M16** A study of smoke clouds in a coastal area. Field experiments near Brownsville, Texas. (Progress Report to September 1, 1943.) Don M. Yost, Carey Croneis and T. S. Gilman. OEMsr-861; Service Project No. CWS-26; OSRD No. 1983. California Institute of Technology. November 4, 1943.
- M17** Dugway trials with the hot-wire meter. (Informal Report No. 10.3A-39.) Wendell M. Latimer, W. D. Gwinn and others. NDCrc-126; Service Project No. CWS-26. University of California. December 10, 1943.
- M18** Correlation of gas concentrations with meteorological data. (Progress Report to November 3, 1943.) Wendell M. Latimer, Samuel Ruben and others. NDCrc-126; Service Project No. CWS-26; OSRD No. 2086. University of California. December 29, 1943.
- M19** Micrometeorological conditions at Prisoner's Harbor on Santa Cruz Island, California, June 24 [to] July 13, 1943. (Informal Report No. 10.3A-41.) Roscoe G. Dickinson, Douglas L. Kraus and others. NDCrc-137 and OEMsr-861; Service Project No. CWS-26. California Institute of Technology. January 25, 1944.
- M20** Micrometeorological observations in connection with DDT operations in Panama. (Informal Report No. 10.3A-47.) Roscoe G. Dickinson. NDCrc-137. California Institute of Technology. January 3, 1945.
- M21** Micrometeorology and the travel of gas clouds. A summary of work by the University of California group. (Final report.) Wendell M. Latimer. NDCrc-126; Service Project Nos. CWS-7, CWS-26

and NS-338; OSRD No. 5139. University of California. June 20, 1945.

302.2 Effect of Terrain on Gas Concentrations

M1 Persistence experiments with sulfur dioxide in a wooded area. (Progress Report to May 31, 1943.) Francis E. Blacet and Jack G. Roof. OEMsr-282; Service Project No. CWS-26; OSRD No. 1569. Northwestern University. June 16, 1943.

M2 Gas concentrations from line sources in a forested area. (Informal Report No. 10.3A-35.) Wendell M. Latimer, Samuel Ruben and others. NDCrc-126 and OEMsr-861; Service Project No. CWS-26. University of California and California Institute of Technology. September 14, 1943.

M3 Concentrations from gas bombs in the Mt. Shasta forest region. (Progress Report to November 17, 1943.) Wendell M. Latimer, Samuel Ruben and others. NDCrc-126; Service Project No. CWS-26; OSRD No. 3049. University of California. December 29, 1943.

M4 Gas concentrations from line sources and chemical-warfare bombs on a beach area. (Progress Report to November 22, 1943.) Wendell M. Latimer, Samuel Ruben and others. NDCrc-126; Service Project No. CWS-26; OSRD No. 3059. University of California. December 31, 1943.

400 GASES

401 General Gases

401.1 Experimentation (General)

M1 Vapor pressure of arsine dissolved in thionyl chloride, p-ethylnitrobenzene, 1-nitropropane, triethyl borate and tributyl borate. (Informal Report No. CXL.) L. F. Audrieth and John C. Bailar, Jr. University of Illinois. June 17, 1942.

M2 Methods of analysis for the freons in air. (Informal Report No. 10.1-13.) Francis E. Blacet, Walter J. Blaedel and Irving M. Klotz. OEMsr-282; Service Project No. CWS-7. Northwestern University. May 14, 1943.

401.11 Instruments and Devices

M1 The hot-wire analyser for gas concentrations. (Progress Report to November 20, 1943.) Wendell M. Latimer, Samuel Ruben and others. NDCrc-126; Service Project No. CWS-26; OSRD No. 3048. University of California. December 3, 1943.

401.111 Gas Concentration Meter

M1 A portable continuous gas concentration meter. (Informal Report No. 10.3A-9.) Roscoe G. Dickinson, Arthur J. Stosick and others. NDCrc-127; Service Project Nos. CWS-7 and NL-B26. California Institute of Technology. February 24, 1943.

M2 Measurement of CC with the portable continuous gas concentration meter. (Informal Report No. 10.3A-12.) Roscoe G. Dickinson and John W.

Otvos. NDCrc-127; Service Project Nos. CWS-7 and NL-B26. California Institute of Technology. March 15, 1943.

M3 Measurements on AC, CC and mixtures of the two with the portable continuous gas concentration meter. (Informal Report No. 10.3A-13.) Roscoe G. Dickinson and John W. Otvos. NDCrc-127; Service Project Nos. CWS-7 and NL-B26. California Institute of Technology. April 15, 1943.

M4 Measurements on SO₂ and NH₃ with the portable continuous gas concentration meter. (Informal Report No. 10.3A-33.) Stanley J. Winkleman and Don M. Yost. OEMsr-861; Service Project No. CWS-26. California Institute of Technology. August 31, 1943.

M5 An alternative circuit for the portable continuous gas concentration meter. (Progress Report to December 31, 1944.) John W. Otvos and Roscoe G. Dickinson. NDCrc-137; Service Project No. CWS-26; OSRD No. 6172. California Institute of Technology. October 18, 1945.

401.12 Diffusion and Penetrability of Gases

401.121 Wind Tunnel Tests

M1 Wind tunnel studies of the diffusion of heat from a line source. (Informal Report No. 10.2-12.) Hunter Rouse, Maurice L. Albertson and others. OEMsr-1243; Service Project No. CWS-1. Iowa Institute of Hydraulic Research. March 18, 1944.

M2 Wind tunnel studies of the diffusion of gas in schematic urban districts. (Report covering period [from] May 1 to December 31, 1943.) Hunter Rouse. OEMsr-599; Service Project No. CWS-26; OSRD No. 3859. Iowa Institute of Hydraulic Research. July 5, 1944.

M3 Wind tunnel studies of the diffusion of heat by single wind curtains and baffles. (Progress Report to July 10, 1944.) Hunter Rouse, Maurice L. Albertson and others. OEMsr-1243; Service Project No. CWS-26; OSRD No. 4334. Iowa Institute of Hydraulic Research. November 11, 1944.

M4 Wind tunnel studies of gas diffusion in a typical Japanese urban district. (Informal Report No. 10.3A-48.) A. A. Kalinske, Randolph A. Jensen and Conrad F. Schadt. OEMsr-1243; Service Project No. CWS-26. Iowa Institute of Hydraulic Research. June 8, 1945.

M5 Correlation of wind tunnel studies with field measurements of gas diffusion. (Informal Report No. 10.3A-48a.) A. A. Kalinske, Randolph A. Jensen and Conrad F. Schadt. OEMsr-1243; Service Project No. CWS-26. Iowa Institute of Hydraulic Research. September 29, 1945.

M6 Wind tunnel studies of fog dispersal methods. Wind tunnel studies of gas diffusion in urban districts. Wind tunnel studies of air flow over mountainous terrain. Hunter Rouse. OEMsr-1243; Service Project Nos. CWS-26, NA-164 and

AC-125; OSRD No. 6341. Iowa Institute of Hydraulic Research. November 19, 1945.

401.122 Closed Court Tests

- M1** The penetration and persistence of carbon dioxide when released in an enclosed court. (Report No. 411.) Francis E. Blacet and H. F. Johnstone. NDCrc-152 and OEMsr-282; Service Project No. CWS-7; OSRD No. 998. University of Illinois and Northwestern University. October 30, 1942.
- M2** Dispersion of gases in a closed court and the design of wind obstacles. (Informal Report No. 10.3A-7, for the period [from] January 15 to February 10, 1943.) H. F. Johnstone, Paul G. Roach and H. C. Weingartner. OEMsr-599; Service Project No. CWS-1. University of Illinois. February 10, 1943.
- M3** Penetration and persistence of gases in an enclosed court. (Progress Report to June 15, 1943.) Francis E. Blacet, Malcolm Dole and H. F. Johnstone. OEMsr-282; Service Project No. CWS-26; OSRD No. 1747. Northwestern University. August 31, 1943.

401.123 Pancake Effect

- M1** The "pancake" effect in gas clouds. Wendell M. Latimer, Kenneth S. Pitzer and others. NDCrc-126; Service Project No. CWS-26; OSRD No. 1176. University of California. February 3, 1943.

401.124 Houses

- M1** The persistence and penetration of gas in a house. (Progress Report to July 10, 1943.) Francis E. Blacet, Jack G. Roof and H. G. Monteith. OEMsr-282; Service Project No. CWS-26; OSRD No. 1748. Northwestern University. August 30, 1943.

402 War Gases

402.1 General Discussion

- M1** The use of non-persistent gases. (Informal Report No. CLII.) W. Albert Noyes, Jr. University of Rochester. July 17, 1942.

402.2 Experimentation and Analysis of War Gases

- M1** The removal of ethylene imine. (Report No. 49.) Philip A. Leighton. NDCrc-122; Service Project No. CWS-7; OSRD No. 111. Stanford University. June 27, 1941.
- M2** Studies on war gas detection and analysis. (Final Report No. 63, to July 12, 1941.) John H. Yoe. NDCrc-166; Service Project No. CWS-7; OSRD No. 125. University of Virginia. August 23, 1941.
- M3** Tube tests with hydrogen fluoride. (Informal Report No. CXLVIII.) Roscoe G. Dickinson, John W. Otvos and Harold S. Johnston. California Institute of Technology. June 29, 1942.
- M4** Sampling methods for field experiments. (Report No. CLXXXVI, for the period [from] August 15 to September 15, 1942.) Wendell M. Latimer, H. W. Anderson and H. O. Kerlinger. NDCrc-

126; Service Project Nos. CWS-7 and NL-B28. University of California. September 15, 1942.

- M5** Rapid methods for synthesizing certain war gases. The chemistry of the sulfur fluorides. (Final Report No. 399.) J. H. Simons. NDCrc-167; Service Project No. CWS-7; OSRD No. 1036. Pennsylvania State College. October 21, 1942.
- M6** Determination of the vapor pressure of HS. (Report No. 459.) W. Conway Pierce, Charles D. Wagner and Ernest J. Lang. OEMsr-282; Service Project Nos. CWS-7; OSRD No. 1144. Northwestern University. December 9, 1942.
- M7** Determination of ammonia concentrations in field tests. (Informal Report No. 10.1-5.) Francis E. Blacet and Jack G. Roof. OEMsr-282; Service Project No. CWS-7. Northwestern University. January 16, 1943.
- M8** Determination of CG in air, using silica gel. (Informal Report No. 10.3A-8.) Roscoe G. Dickinson, John W. Otvos and Harold S. Johnston. NDCrc-127; Service Project Nos. CWS-7 and NL-B26. California Institute of Technology. February 8, 1943.
- M9** Nitrobenzene as a compound to simulate HS. Distribution of nitrobenzene vapors in a closed room. (Progress Report to February 15, 1943.) Malcolm Dole. OEMsr-861; Service Project No. CWS-26; OSRD No. 1447. California Institute of Technology. May 20, 1943.
- M10** Preparation of certain extremely pure strontium salt. (Informal Report No. 10.3B-26.) Gregory P. Baxter. OEMsr-917; Service Project No. CWS-7. Harvard University. June 17, 1943.
- M11** Experiments on the accumulation of sulfur dioxide in fox holes. (Informal Report No. 10.3A-25.) Don M. Yost and Richard W. Dodson. OEMsr-861; Service Project No. CWS-26. California Institute of Technology. June 20, 1943.
- M12** Further experiments on the accumulation of sulfur dioxide in fox holes. (Informal Report No. 10.3A-31.) Richard W. Dodson, Don M. Yost and others. OEMsr-861; Service Project No. CWS-26. California Institute of Technology. August 27, 1943.
- M13** Chemical analysis of mixtures of NH_3 and air, and SO_2 and air. (Informal Report No. 10.3A-34.) Stanley J. Winkleman and Don M. Yost. OEMsr-861; Service Project No. CWS-26. California Institute of Technology. August 31, 1943.
- M14** Present status of development of toxic gases. (Special Report to November 15, 1943.) W. Albert Noyes, Jr. OSRD No. 2088. December 2, 1943.
- M15** Determination of CC and CG concentrations in field tests. (Informal Report No. 10.3A-42.) H. G. Monteith, Jack G. Roof and Francis E. Blacet. OEMsr-282; Service Project No. CWS-26. Northwestern University. April 1, 1944.
- M16** Determination of SO_2 concentrations in field tests. (Informal Report No. 10.3A-43.) H. G. Monteith, Jack G. Roof and Francis E. Blacet. OEMsr-282;

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Service Project No. CWS-26. Northwestern University. April 1, 1944.

402.21 Ultraviolet Photometer

- M1** An ultraviolet photometer for the detection and quantitative estimation of very small concentrations of noxious gases in air. (Report No. 108, to September 15, 1941.) Malcolm Dole, Irving M. Klotz and others. OEMsr-22; Service Project No. CWS-7; OSRD No. 170. Northwestern University. November 7, 1941.
- M2** Ultraviolet photometer for war gases. (Informal Report No. XLIV.) Malcolm Dole, Irving M. Klotz and Sol W. Weller. Northwestern University. November 19, 1941.
- M3** An ultraviolet photometer for routine analysis. (Informal Report No. CCI.) Malcolm Dole, Irving M. Klotz and W. E. Roake. OEMsr-282; Service Project No. CWS-7. Northwestern University. November 5, 1942.

402.3 Preparation of War Gases, Purification and Stabilization

- M1** Operation manual for Dickinson field conductivity meter. Robert K. Brinton and John W. Otvos. OEMsr-282; Service Project No. CWS-26; OSRD No. 5344. Northwestern Technological Institute. July 18, 1945.

402.31 Fluorine

- M1** The generation of fluorine. (Report No. 416.) Walter C. Schumb. OEMsr-588; Service Project No. CWS-7; OSRD No. 984. Massachusetts Institute of Technology. November 3, 1942.
- M2** The generation of fluorine. (Informal Report Nos. VI; 10.3B-1, -4, -7, -15, -18, -22, -28, -31; 10.1-31, -34 and -37, for . . . November 15, December 15, 1942, January 15, February 15, March 15, April 15, May 15, July 15, August 15, September 15, October 15 and November 15, 1943.) Walter C. Schumb, E. Lee Gamble and others. OEMsr-588; Service Project Nos. CWS-7 and CWS-26. Massachusetts Institute of Technology.
- M3** The production of fluorine by electrolysis. (Report No. 455, to July 1, 1942.) R. C. McHarness, R. G. Benner and others. OEMsr-414; Service Project No. CWS-7; OSRD No. 1114. E. I. duPont de Nemours and Company, Inc. December 9, 1942.
- M4** The generation of fluorine. (Progress Report to June 15, 1943.) Walter C. Schumb, E. Lee Gamble and others. OEMsr-588; Service Project No. CWS-7; OSRD No. 1690. Massachusetts Institute of Technology. August 6, 1943.
- M5** The generation of fluorine. (Final Report to January 12, 1944.) Walter C. Schumb. OEMsr-588; Service Project No. CWS-7; OSRD No. 3227. Massachusetts Institute of Technology. February 9, 1944.

402.311 Related Fluorine Compounds

- M1** The preparation of acyl fluorides. The preparation

of ozalyl fluoride. (Informal Report No. LIV.) J. H. Simons. Pennsylvania State College. December 16, 1941.

- M2** The fluorides of sulphur. (Parts I to III.) J. H. Simons. Pennsylvania State College. January 24, March 13 and May 13, 1942.
- M3** Letter to Dr. Noyes. Subject: Progress report for May. L. F. Audrieth and John C. Bailar, Jr. University of Illinois. May 14, 1942.
- M4** The dialkyl monofluophosphates. (Informal Report No. CXLI.) L. F. Audrieth and John C. Bailar, Jr. University of Illinois. June 16, 1942.
- M5** Fluophosphates and related compounds. (Informal Report No. CLVII.) L. F. Audrieth and John C. Bailar, Jr. [University of Illinois.] July 15, 1942.
- M6** Fluorosulfonic acid and its alkyl esters. (Informal Report No. CLVIII.) L. F. Audrieth and John C. Bailar, Jr. [University of Illinois.] July 15, 1942.
- M7** Studies relating to phosphorus trifluoride. (Informal Report No. CLIX.) Anton B. Burg. University of Southern California. July 27, 1942.
- M8** Preliminary tube tests with various substances. Roscoe G. Dickinson. NDCrc-137. California Institute of Technology. August 5, 1942.
- M9** Vapor pressures of diethyl fluophosphate, ethyl difluophosphate, dimethyl fluophosphate, ethyl fluosulfonate and trimeric phosphonitrilic chloride. (Informal Report No. CLXXX, for the period [from] July 15 to August 15, 1942.) L. F. Audrieth and John C. Bailar, Jr. OEMsr-299; Service Project No. CWS-7. University of Illinois. August 15, 1942.
- M10** Alkyl fluosulfonates. Phosphonitrilic fluoride. (Informal Report No. CLXXXI, for the period from July 15 to August 15, 1942.) L. F. Audrieth and John C. Bailar, Jr. OEMsr-299; Service Project No. CWS-7. University of Illinois. August 15, 1942.
- M11** Phosphonitrilic fluoride. Diethyl sulfamyl fluoride. (Informal Report No. CLXXXIX, for the period [from] August 15 to September 14, 1942.) L. F. Audrieth, John C. Bailar, Jr. and Fred Basolo. OEMsr-299; Service Project No. CWS-7. University of Illinois. September 14, 1942.
- M12** The alkyl difluophosphates and the mono- and difluothiophosphates. (Informal Report No. CLXXXVIII, for the period [from] August 15 to September 15, 1942.) L. F. Audrieth, John C. Bailar, Jr. and Mark M. Woyski. OEMsr-299; Service Project No. CWS-7. University of Illinois. September 15, 1942.
- M13** Fluophosphates and related compounds. (Informal Reports for October 15 and November 15, 1942.) John C. Bailar, Jr., Mark M. Woyski and Morton B. Epstein. OEMsr-299. University of Illinois.
- M14** Fluophosphates and related compounds. ([Part] VI to X. Informal Report Nos. 10.3B-2, -5, -12, -13 and -21, for the period from November 15, 1942 to April 15, 1943.) John C. Bailar, Jr., Mark

M. Woyski and others. OEMsr-299. University of Illinois.

- M15** New toxic gases. (Parts VII to IX. Informal Report Nos. 10.3B-8, -14 and -17, for the period from January 18 to April 15, 1943.) Anton B. Burg, Don L. Armstrong and Russell N. Doescher. NDCrc-113; Service Project No. CWS-26. University of Southern California.

402.32 Compound 1120

- M1** Improved methods of preparation and preliminary study of physical and chemical properties of Compound 1120. (Report No. 117.) Anton B. Burg. NDCrc-113; Service Project No. CWS-7; OSRD No. 179. University of Southern California. November 15, 1941.
- M2** The preparation and properties of Compound 1120. (Part II. Report No. 149.) Anton B. Burg, Don L. Armstrong and others. NDCrc-131; OSRD No. 294. University of Southern California. December 30, 1941.
- M3** A study of the preparation of Compound 1120 through the use of a regenerative chemical. George L. Clark and P. M. Bernays. OEMsr-226. University of Illinois. February 15, 1942.
- M4** The preparation and properties of Compound 1120. (Parts IV, V and VII.) Anton B. Burg, Don L. Armstrong and others. NDCrc-113. University of Southern California. February 15, March 20 and May 15, 1942.
- M5** Calorimetric studies of Compound 1120. Hugh M. Huffman, John B. Hatcher and E. L. Ellis. California Institute of Technology. March 15, 1942.
- M6** Letter to Dr. W. A. Noyes, Jr. Subject: Progress report of J. H. Simons, re Compound 1120. J. H. Simons. April 19, 1942.
- M7** A study of the preparation of Compound 1120 through the use of a regenerative chemical. George L. Clark. May 25, 1942.
- M8** New toxic agents: Compound 1120. (Parts I to V. Progress Reports for the period July 15 to December 21, 1942.) Anton B. Burg, Don L. Armstrong and Russell N. Doescher. NDCrc-113; Service Project No. CWS-26. University of Southern California.

402.33 Hydrogen Cyanide and Flame-Damping

- M1** New toxic gases, Parts XII to XIV. Flame-damping of cyanogen chloride, Parts I to VII. Stabilization of cyanogen chloride, Parts II to VII and Part XII. (Informal Report Nos. 10.3B-25, -30; 10.4-34, -37, -39, -44 and -61, for . . . July 15, August 15, September 15, October 14, November 15, December 14, 1943 and May 15, 1944.) Anton B. Burg, Don L. Armstrong and Russell N. Doescher. NDCrc-113 and OEMsr-1004; Service Project Nos. CWS-26 and CWS-7. University of Southern California.

402.34 Cyanogen and Cyanogen Chloride

- M1** Further experiments with cyanogen. Stability of CC. (Informal Report No. CLXXIII, for the period from July 15 to August 15, 1942.) Wendell M. Latimer, H. W. Anderson and H. O. Kerlinger. NDCrc-126; Service Project No. CWS-7. University of California. August 14, 1942.
- M2** Experiments with CC and C_2N_2 . (Informal Report No. CCXIV, for the period from October 15 to November 15, 1942.) Wendell M. Latimer and H. O. Kerlinger. NDCrc-126; Service Project Nos. CWS-7 and NL-B28. University of California. November 15, 1942.
- M3** Stabilization of cyanogen chloride. (Parts VIII to XI and XIII to XX. Informal Report Nos. 10.4-47, -50, -52, -58, -66, -68, -70, -72, -76, -78, -79, and -80, for . . . January 15, February 14, March 13, April 15, June 15, July 15, August 15, September 15, October 14, November 15, December 14, 1944 and January 14, 1945.) Anton B. Burg, Don L. Armstrong and Russell N. Doescher. OEMsr-1004; Service Project No. CWS-7. University of Southern California.

402.35 Radioactive War Agents

- M1** The preparation of radioactive chlorpicrin. (Informal Report No. IV.) J. H. Simons. May 28, 1941.
- M2** Preparation of radioactive cyanogen chloride. (Informal Report No. VIII.) J. H. Simons. Pennsylvania State College. July 22, 1941.
- M3** The development of laboratory methods of detecting and analyzing gases containing radioactive sulfur. (Report No. 65.) (n.a.) NDCrc-115; Service Project No. CWS-7; OSRD No. 127. California Institute of Technology. August 25, 1941.
- M4** The measurement of radioactive hydrogen. (Final Report No. 66, to August 15, 1941.) E. O. Lawrence. NDCrc-135; Service Project No. CWS-7; OSRD No. 128. University of California. August 26, 1941.
- M5** Preparation of radioactive hydrocyanic acid. (Informal Report No. LIII.) J. H. Simons. Pennsylvania State College. December 11, 1941.
- M6** The preparation of radioactive selenium hexafluoride. (Informal Report No. LXXXI.) J. H. Simons. Pennsylvania State College. February 12, 1942.

402.36 Miscellaneous Gases

- M1** Rapid methods of preparing phosgene. (Report No. 25.) (n.a.) Service Project No. CWS-7; OSRD No. 88. Pennsylvania State College. April 21, 1941.
- M2** The preparation and preliminary study of $(CH_3)_2NPF_2$. (Report No. CLXI.) Anton B. Burg. July 24, 1942.
- M3** Heat of formation of S_2F_{10} . (Report No. 306.) Hugh M. Huffman, John B. Hatcher and E. L. Ellis. OEMsr-199; Service Project No. CWS-7;

OSRD No. 776. California Institute of Technology. July 29, 1942.

- M4** Calorimetric studies. [Part] II, The entropy and free energy of S_2F_{10} . (Report No. 389.) Hugh M. Huffman, John B. Hatcher and G. B. Guthrie. OEMsr-199; Service Project No. CWS-7; OSRD No. 934. California Institute of Technology. October 10, 1942.
- M5** Thermodynamic data on S_2F_{10} . (Report No. 430.) Hugh M. Huffman. OEMsr-199; Service Project No. CWS-7; OSRD No. 1053. California Institute of Technology. November 21, 1942.
- M6** Thermal data on KB-16. (Informal Report Nos. 10.3B-9 and -11, for the period [from] January 15 to March 15, 1943.) Hugh M. Huffman, John B. Hatcher and G. B. Guthrie. OEMsr-199; Service Project No. CWS-7. California Institute of Technology.
- M7** Thermal data on KB-14 and KB-16. (Final Report to April 15, 1943.) Hugh M. Huffman, John B. Hatcher and G. B. Guthrie. OEMsr-199; Service Project No. CWS-7; OSRD No. 1477. California Institute of Technology. June 1, 1943.
- M8** The preparation of new toxic gases. (Final Report to June 5, 1944.) Anton B. Burg, Don L. Armstrong and others. NDCrc-113; Service Project Nos. CWS-7 and NL-B26; OSRD No. 4012. University of Southern California. August 12, 1944.

500 AEROSOLS (SMOKE AND FOGS)

- M1** Aerosols. (Report No. 14.) (n.a.) Service Project No. CWS-1; OSRD No. 77. University of Illinois, Princeton University and others. March 12, 1941.
- M2** Proceeding of the conference on aerosols [at] Evanston, Illinois [from] February 25 [to] 27, 1943. (n.a.) [February, 1943.]
- M3** [Aerosols.] (Monthly Progress Reports for the months of January, 1944 and September, 1944 to June, 1945.) (n.a.) OEMsr-102; Service Project Nos. CWS-27, AC-108 and others. University of Illinois.
- M4** Preparation and properties of aerosols. F. T. Wall. OEMsr-108; Service Project No. CWS-1; OSRD No. 5241. University of Illinois. June 21, 1945.
- M5** [Aerosols.] Final report on Contract OEMsr-102, including Contract OEMsr-599. H. F. Johnstone and Edward W. Comings. OEMsr-102 and OEMsr-599; Service Project Nos. CWS-1, CWS-27 and others; OSRD No. 6373. University of Illinois. November 30, 1945.

501 Smoke

- M1** Production, analysis and use of aerosols of uniform particle size. (Report No. 57.) Victor K. LaMer and David Sinclair. NDCrc-33; Service Project No. CWS-1; OSRD No. 119. Columbia University. August 8, 1941.
- M2** Mechanical formation of smokes. (Report No. 91.)

George G. Brown. OSRD No. 153. University of Michigan. October 18, 1941.

501.1 Physical Properties

- M1** The theory of coagulation of smokes in closed vessels. (Report No. 17.) (n.a.) Service Project No. CWS-1; OSRD No. 80. General Electric Company. March 27, 1941.
- M2** Verification of Mie theory. Calculations and measurements of light scattering by dielectric spherical particles. Victor K. LaMer. OEMsr-148; Service Project No. CWS-1; OSRD No. 1857. Columbia University. September 29, 1943.

501.11 Particle Size

- M1** Analysis of inhomogeneous smoke. (Report No. 93.) Victor K. LaMer and David Sinclair. NDCrc-33; Service Project No. CWS-1; OSRD No. 155. Columbia University. November 5, 1941.
- M2** Studies of particle size in smokes. (Progress Report No. 136, to October 1, 1941.) Henry Eyring. NDCrc-28; Service Project No. CWS-1; OSRD No. 292. Princeton University. December 8, 1941.
- M3** Production of smokes of homogeneous particle size for screening tests and development of dyes from thermally dispersed smokes. (Report No. 170.) Victor K. LaMer and Seymore Hochberg. OEMsr-148; Service Project No. CWS-1; OSRD No. 364. Columbia University. January 29, 1942.
- M4** Characteristics of different models of the Owl. (Informal Report No. 10.2-3.) David Sinclair, Seymore Hochberg and others. OEMsr-148; Service Project No. CWS-1. Columbia University. July 23, 1943.
- M5** Determination of the particle size distribution in smokes by analysis of the scattered light. (Informal Report No. 10.2-4.) David E. Goldman and Victor K. LaMer. OEMsr-148; Service Project No. CWS-1. Columbia University. July 28, 1943.
- M6** A portable optical instrument for the measurement of particle size in smokes, the Owl. An improved homogeneous aerosol generator. Victor K. LaMer and David Sinclair. OEMsr-148; Service Project No. CWS-1; OSRD No. 1668. Columbia University. August 3, 1943.
- M7** Polarization relationships in homogeneous and inhomogeneous smokes. Owl settings for DOP smokes. (Informal Report No. 10.1-27.) Frank T. Gucker, Jr., Hugh B. Pickard and C. T. O'Konski. OEMsr-282; Service Project Nos. CWS-1 and NL-B34. Northwestern University. September 7, 1943.
- M8** Thermal forces as a means of determining particle size and size distribution of aerosols. (Informal Report No. 10.2-5.) Victor K. LaMer, David Sinclair and David E. Goldman. OEMsr-148; Service Project No. CWS-1. Columbia University. September 23, 1943.
- M9** The slope-o-meter, an instrument for the rapid determination of particle radius and concentration

in the laboratory and field. (Informal Report No. 10.2-15.) Victor K. LaMer and Seymore Hochberg. OEMsr-148; Service Project No. CWS-1. Columbia University. June 19, 1944.

- M10** The suitability of vertical slides as a particle size measurement method. (Informal Report No. 10.2-21.) Irwin B. Wilson. OEMsr-1388; Service Project Nos. CWS-1, SG-6 and NM-100. Columbia University. August, 1945.

501.12 Deposition

- M1** The evaporation of small drops of thiodiglycol and Levinstein mustard. (Progress Report to August 1, 1943.) H. F. Johnstone and R. W. Parry. OEMsr-102; Service Project No. CWS-27; OSRD No. 2002. University of Illinois. November 9, 1943.
- M2** The deposition of drops of a non-volatile liquid vesicant on vertical and horizontal surfaces. (Informal Report No. 10.4-49.) Warren E. Winsche and H. F. Johnstone. OEMsr-102; Service Project No. CWS-26. University of Illinois. January 15, 1944.
- M3** The deposition of non-volatile aerosol clouds in open and forested areas. (Informal Report No. 10.4-55.) Warren E. Winsche and H. F. Johnstone. OEMsr-102; Service Project No. CWS-26. University of Illinois. March 1, 1944.

501.2 Generators, Nozzles and Sprayers

- M1** Production of smokes of controlled size by the use of induction nozzles. (Report No. 167.) H. C. Hottel. Service Project No. CWS-1; OSRD No. 468. Massachusetts Institute of Technology. January 12, 1942.
- M2** Smoke investigations. (Informal Report No. 10.4-21.) Edward W. Comings. OEMsr-102; Service Project No. CWS-1. University of Illinois. May 15, 1943.
- M3** Use of sulfur boiler for smoke generation. (Final Report to December 31, 1942.) W. K. Lewis. OEMsr-587; Service Project No. CWS-1; OSRD No. 1692. Massachusetts Institute of Technology. August 9, 1943.
- M4** A continuous sulphur smoke generator. (Progress Report to October 2, 1943.) Edward W. Comings and W. L. Lundy. OEMsr-102; Service Project No. CWS-1; OSRD No. 3213. University of Illinois and Kimberly-Clark Corporation. February 4, 1944.
- M5** Tests on CO₂ spraying devices. (Progress Report to December 30, 1943.) F. G. Straub and R. J. Kallal. OEMsr-102; Service Project No. CWS-27; OSRD No. 3577. University of Illinois. May 4, 1944.
- M6** A study of the atomization of liquids. (Report No. 148.) H. C. Lewis, David G. Edwards and others. OEMsr-102; Service Project Nos. CWS-1 and CWS-27; OSRD No. 6345. University of Illinois. November 23, 1945.

501.201 Coil Type

- M1** Smoke generator. (Report No. 217.) Irving Langmuir and V. J. Shaefer. OEMsr-131; Service Project No. CWS-17; OSRD No. 487. General Electric Company. March 31, 1942.
- M2** Large-scale screening tests with Esso smoke generators. (Informal Report No. 10.3A-21.) H. F. Johnstone. Service Project No. CWS-26. University of Illinois. May 26, 1943.

501.202 Combustion Type

- M1** Wetness in screening smokes and a comparison of the quality of smoke from the Hession and Besler units at Edgewood Arsenal, November 9 and 10, 1943. (Informal Report No. 10.2-11.) Victor K. LaMer, Frank Brescia and others. OEMsr-148; Service Project No. CWS-1. Columbia University. January 20, 1944.
- M2** Combustion gas-type fog generator for shipboard installation, 400-500 GPH capacity. Machine No. H-202. (Progress Report to June 30, 1944.) John W. Hession, Jr. and Victor K. LaMer. OEMsr-148; Service Project No. CWS-1; OSRD No. 4377. Columbia University. November 23, 1944.

501.203 Exhaust

- M1** The tailpipe combustion unit to increase the rate of smoke production of TBM-3 exhaust generator. (Informal Report No. 10.4-82.) Paul A. Pitt. OEMsr-1446. Solar Aircraft Company. June 15, 1945.
- M2** The development of an exhaust smoke generator for military aircraft. (Report No. 112.) H. F. Johnstone and M. J. Goglia. OEMsr-102; Service Project No. CWS-1; OSRD No. 5488. University of Illinois. August 25, 1945.
- M3** Development of exhaust combustion smoke generator for the TBM-3 airplane. Paul A. Pitt. OEMsr-1446; Service Project Nos. CWS-1, SG-6 and NM-100; OSRD No. 6343. Solar Aircraft Company. November 23, 1945.

501.21 Pots

- M1** The development of a filling mixture for smoke pots, grenades and floats. (Informal Report Nos. 10.4-28, -32, -33, -36, -41, -45, -51, -54, -59, -62, -64, -67, -69 and -71, for . . . July 5, August 2, September 6, October 4, November 8, 1943, January 3, February 7, March 6, April 3, May 8, June 5, July 3, August 7 and September 4, 1944.) H. H. Champney, L. B. Counterman and others. OEMsr-1021; Service Project No. CWS-27. Hercules Powder Company, Inc.
- M2** Development of the SN screening smoke mixture. (Progress Report to May 1, 1943.) Edward W. Comings, C. H. Adams and others. OEMsr-102; Service Project No. CWS-1; OSRD No. 1772. University of Illinois. September 4, 1943.
- M3** The development of a portable aerosol smoke pot. (Report to October 2, 1944.) H. H. Champney,

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L. B. Counterman and others. OEMsr-1021; Service Project No. CWS-1; OSRD No. 4565. Hercules Powder Company, Inc. January 9, 1945.

- M4** Development of the training oil smoke pot, E-21. M. F. Nathan, R. W. Davis and Edward W. Comings. OEMsr-102; Service Project No. CWS-1; OSRD No. 6211. University of Illinois. October 24, 1945.

- M5** Development of oil thermal generator floating smoke pot, E-23. M. F. Nathan, R. W. Davis and others. OEMsr-102; Service Project Nos. CWS-1 and CWS-27; OSRD No. 6428. University of Illinois. December 29, 1945.

501.22 Oils

- M1** Properties of oils with special reference to their use in smoke generators. (Informal Report No. 10.2-7.) Victor K. LaMer, Seymore Hochberg and others. OEMsr-148; Service Project No. CWS-1. Columbia University. October 18, 1943.

- M2** Comparison of SGF No. 1 oil [of the] Texas Company with other oils for use in oil fog generators. (Informal Report No. 10.2-8.) Victor K. LaMer, Seymore Hochberg and others. OEMsr-148; Service Project No. CWS-1. Columbia University. October 18, 1943.

501.23 Signals

- M1** Field and laboratory testing of smoke signals with special reference to floating distress signals for air-sea rescue. (Informal Report No. 10.2-17.) Victor K. LaMer, David Sinclair and others. OEMsr-148; Service Project No. CWS-1. Columbia University. September 19, 1944.

- M2** A new daytime distress signal. (Informal Report No. 10.2-16.) Irving Johnson and Victor K. LaMer. OEMsr-148; Service Project No. CWS-1. Columbia University. October 23, 1944.

- M3** Testing of daytime distress signals. (Progress Report to September 19, 1944.) Victor K. LaMer, Jacob Q. Umberger and others. OEMsr-148; Service Project Nos. CWS-1 and NE-104; OSRD No. 4539. Columbia University. January 5, 1945.

- M4** Development of a floating colored smoke signal, DS-4. David G. Edwards, C. H. Adams and others. OEMsr-102; Service Project Nos. CWS-1; NE-104 and NO-276; OSRD No. 6375. University of Illinois. December 10, 1945.

502 Smoke Screens

- M1** The formation of screening smokes. (Report No. 194, to January 15, 1942.) George G. Brown, Fred Kurata and Blaine B. Kuist. OSRD No. 414. University of Michigan. February 26, 1942.

- M2** Screening smokes. (Report No. 197.) [T. K. Sherwood.] OSRD No. 436. March 15, 1942.

- M3** The efficient generation of chlorosulphonic acid smokes for screening purposes. (Informal Report No. 10.2-1, covering period from December 15, 1942 to March 28, 1943.) Victor K. LaMer, Seymore

Hochberg and Irwin B. Wilson. OEMsr-148; Service Project No. CWS-1. Columbia University. March 28, 1942.

- M4** Use of aqueous solutions for producing screening fogs or smokes by pneumatic spray nozzles. (Report No. 231.) Axel R. Olson and George D. Gould. OEMsr-236; Service Project No. CWS-17; OSRD No. 537. University of California. April 29, 1942.

- M5** Screening smokes. (Report No. 381.) W. H. Rodebush, Victor K. LaMer and others. OEMsr-108, OEMsr-148 and OEMsr-131; Service Project Nos. CWS-1 and CWS-17; OSRD No. 940. University of Illinois, Columbia University and General Electric Company. October 5, 1942.

- M6** The mechanical formation of screening smokes using salt solutions. (Report No. 408.) George G. Brown, Fred Kurata and C. M. Sliepcevich. NDCrc-208; Service Project No. CWS-17; OSRD No. 980. University of Michigan. October 29, 1942.

- M7** Practical consideration involved in the use of screening smokes. W. H. Rodebush. OEMsr-108; Service Project No. CWS-1; OSRD No. 1321. University of Illinois. April 9, 1943.

- M8** A study of oil smoke plumes by motion pictures. (Progress Report to June 15, 1943.) H. F. Johnstone and Paul G. Roach. OEMsr-599; Service Project No. CWS-26; OSRD No. 1697. University of Illinois. August 6, 1943.

- M9** New chlorine carriers for metal chloride screening smoke mixtures. (Progress Report to July 1, 1943.) Edward W. Comings, R. W. Parry and others. OEMsr-102; Service Project No. CWS-1; OSRD No. 3011. University of Illinois. December 14, 1943.

503 Fogs

503.1 Generation

- M1** Production of artificial fog by spraying salt solutions. (Report No. 10.) Weldon G. Brown. Service Project No. CWS-1; OSRD No. 73. January 17, 1941.

- M2** Mechanical formation of fogs. (Report No. 174.) Weldon G. Brown. OSRD No. 375. University of Chicago. February 7, 1942.

503.2 Dissipation

- M1** Dissipation of water fog by intense sound of audible frequency. Victor K. LaMer, David Sinclair and Frank Brescia. OEMsr-148; Service Project No. CWS-1; OSRD No. 1667. Columbia University. August 3, 1943.

- M2** Large horn for the concentration of sound from a Victory siren for use in fog dissipation. (Informal Report No. 10.2-6.) David Sinclair and Victor K. LaMer. OEMsr-148; Service Project No. CWS-1. Columbia University. October 15, 1943.

- M3** Tests of sonic dissipation of fog in California. (Informal Report No. 10.2-13.) David Sinclair, Frank Brescia and Victor K. LaMer. OEMsr-148; Service

Project No. CWS-1. Columbia University. April 13, 1944.

- M4** Study of the use of air curtains for fog dissipation. (Progress Report to March 31, 1944.) A. P. Kratz, E. C. Manthei and others. OEMsr-108; Service Project No. NA-164; OSRD No. 3775. University of Illinois. June 13, 1944.

504 Munitions for Smoke and Toxic Gases

- M1** The concentration of vapor in H aerosol clouds. (Progress Report to November 1, 1943.) H. F. Johnstone and Warren E. Winsche. OEMsr-102; Service Project No. CWS-27; OSRD No. 3284. University of Illinois. February 22, 1944.
- M2** [Munitions for gas dispersal.] (Monthly progress report.) (n.a.) OEMsr-102; Service Project No. CWS-27. University of Illinois. March, 1944.

504.1 Generators

- M1** The generation and use of concentrated mustard vapor clouds. (Progress Report to October 20, 1943.) H. F. Johnstone and Edward W. Comings. OEMsr-102; Service Project No. CWS-27; OSRD No. 3012. University of Illinois. December 14, 1943.
- M2** Development of an experimental thermal generator pot for dispersing mustard gas as an aerosol. C. H. Adams, M. H. Raila and Edward W. Comings. OEMsr-102; Service Project No. CWS-27; OSRD No. 6431. University of Illinois. December 29, 1945.

504.11 Fuel Blocks

- M1** Improvements in the fuel block for the thermal vapor generator. (Informal Report No. 10.4-43.) Edward W. Comings and R. W. Parry. OEMsr-102; Service Project No. CWS-27. University of Illinois. December 3, 1943.
- M2** Fuel blocks for the Model G-8 thermal generator bomb. (Informal Report No. 10.4-63.) Edward W. Comings and R. W. Parry. OEMsr-102; Service Project No. CWS-27. University of Illinois. May 1, 1944.
- M3** Fuel blocks for thermal generators. R. W. Parry, M. H. Raila and others. OEMsr-102; Service Project Nos. CWS-1 and CWS-27; OSRD No. 6636. University of Illinois. March 11, 1946.

504.12 Candles

- M1** A study of the dispersion of solids in gases. (Final Report No. 75, to September 2, 1941.) Reston Stevenson. NDCrc-18; Service Project No. CWS-1; OSRD No. 137. College of the City of New York. September 10, 1941.
- M2** Development of a smoke unit. (Report No. 227.) Edward W. Comings. OEMsr-102; Service Project No. CWS-1; OSRD No. 518. University of Illinois. April 23, 1942.
- M3** Toxic smoke candle. Screening smoke units. (Report No. 440.) Edward W. Comings. OEMsr-102;

Service Project No. CWS-1; OSRD No. 1076. University of Illinois. December 1, 1942.

- M4** Smoke investigations. (Informal Report No. 10.4-24.) Edward W. Comings, E. D. Shippee and others. OEMsr-102; Service Project No. CWS-1. University of Illinois. June 15, 1943.

- M5** The development of the thermal generator candle. (Progress Report to November 1, 1943.) Edward W. Comings, E. D. Shippee and M. Forester. OEMsr-102; Service Project No. CWS-27; OSRD No. 3150. University of Illinois. January 18, 1944.

504.2 Explosives, Bombs, etc.

- M1** A study of aerosols produced by the Olson bomb. (Informal Report No. 10.1-14.) Frank T. Gucker, Jr., Hugh B. Pickard and C. T. O'Konski. OEMsr-282; Service Project Nos. CWS-1 and NL-B34. Northwestern University. May 15, 1943.
- M2** A method for determining dispersibility of powdered solids by high explosive bursts. (Informal Report No. 10.2-10.) Paul L. Salzberg, J. L. Keats and F. C. McGrew. OEMsr-963; Service Project No. CWS-1. E. I. duPont de Nemours and Company, Inc. December 10, 1943.
- M3** The assessment of aerosols. (Informal Report No. 10.4-48.) R. L. LeTourneau, Warren E. Winsche and H. F. Johnstone. OEMsr-102; Service Project No. CWS-26. University of Illinois. December 31, 1943.
- M4** Particle size measurements on certain aerosol bombs for the Department of Agriculture. (Informal Report No. 10.2-14.) Victor K. LaMer, Seymore Hochberg and others. OEMsr-148; Service Project No. CWS-1. Columbia University. April 24, 1944.
- M5** Field methods of dispersing chemical-warfare agents. (Report to March 17, 1944.) Axel R. Olson and Karl Jan Tong. OEMsr-539; Service Project No. CWS-27; OSRD No. 3578. University of California. May 4, 1944.
- M6** Development of munitions for dispersing solid particulates. (Progress Report to July 15, 1944.) H. F. Johnstone, R. L. LeTourneau and others. OEMsr-102; Service Project No. CWS-27; OSRD No. 4166. University of Illinois. September 25, 1944.
- M7** The temperature of the liquid contents of munitions exposed to sunlight. (Progress Report to January 2, 1945.) George C. Gross, Don L. Armstrong and Anton B. Burg. OEMsr-1004; Service Project No. CWS-26; OSRD No. 4848. University of Southern California. April 1, 1945.
- M8** Gas ejection bombs for the dispersal of finely divided powders. C. A. Getz and J. C. Hesson. OEMsr-102; Service Project No. CWS-27; OSRD No. 5489. Cardox Corporation and University of Illinois. August 25, 1945.
- M9** Telescoping metal tails for a small cluster bomb, thermal generator, 10-lb, E-29R1. E. C. Manthei and J. A. Peck. OEMsr-102; Service Project Nos.

CWS-1 and CWS-27; OSRD No. 6121. University of Illinois. October 17, 1945.

- M10** Development of a small base ejection air-burst bomb for dispersing liquid agents. R. J. Kallal, R. W. Davis and H. F. Johnstone. OEMsr-102; Service Project No. CWS-1; OSRD No. 6300. University of Illinois. November 7, 1945.

- M11** Development of a colored smoke target identification bomb (bomb, target identification, smoke, Mark 72, Model 2.) C. H. Adams, Edward H. Conroy and Edward W. Comings. OEMsr-102; Service Project No. NO-276; OSRD No. 6432. University of Illinois. December 29, 1945.

- M12** The development of a light high-explosive bomb for dispersing toxic and insecticidal aerosols. H. F. Johnstone, R. L. LeTourneau and H. C. Weingartner. OEMsr-102; Service Project Nos. CWS-1, NM-100 and CWS-27; OSRD No. 6565. University of Illinois. January 28, 1946.

504.21 White Phosphorus

- M1** The use of carbon black in white-phosphorus shells. (Informal Report No. 10.4-40.) T. M. Beck. OEMsr-948. Victor Chemical Works. November 11, 1943.

- M2** Static firing tests on tail-ejector, E-5, bombs. Notes on white phosphorus in antipersonnel role. (Informal Report No. 10.4-42.) T. M. Beck. OEMsr-948. Victor Chemical Works. December 7, 1943.

- M3** Preparation of plasticized phosphorus mixtures. (Informal Report No. 10.4-53.) John C. Bailar, Jr., Mark M. Woyski and E. A. Ford. OEMsr-299 and OEMsr-102; Service Project No. CWS-26. University of Illinois. February 1, 1944.

- M4** Tests on M-69 bombs charged with coated precast blocks of white phosphorus. (Informal Report No. 10.4-56.) T. M. Beck and Howard Adler. OEMsr-948. Victor Chemical Works. March 30, 1944.

- M5** Plasticized white phosphorus, PWP. (Informal Report No. 10.4-57.) John C. Bailar, Jr., Mark M. Woyski and others. OEMsr-299 and OEMsr-102; Service Project No. CWS-26. University of Illinois. April 10, 1944.

- M6** Factors affecting the thermal stability of plasticized phosphorus. (Informal Report No. 10.4-65.) John C. Bailar, Jr. and Mark M. Woyski. OEMsr-299; Service Project No. CWS-27. University of Illinois. June 30, 1944.

- M7** The development of plasticized white phosphorus. (Part IV. Informal Report No. 10.4-73.) John C. Bailar, Jr., Mark M. Woyski and others. OEMsr-299 and OEMsr-102; Service Project No. CWS-27. University of Illinois. September 1, 1944.

- M8** Pilot plant study of the processing of plasticized white phosphorus. (Report to July 29, 1944.) Howard Adler and George Klein. OEMsr-948; Service Project Nos. CWS-1 and CWS-27; OSRD No. 4157. Victor Chemical Works. September 21, 1944.

- M9** Plasticized white phosphorus in small smoke munitions. (Progress Report to November 15, 1944.)

R. I. Rice, M. F. Nathan and others. OEMsr-102; Service Project Nos. CWS-1 and CWS-27; OSRD No. 4700. University of Illinois. February 16, 1945.

- M10** The apparent viscosity of plasticized white phosphorus. (Informal Report No. 10.4-81.) E. A. Ford, Mark M. Woyski and others. OEMsr-102; Service Project No. CWS-27. University of Illinois. February 20, 1945.

- M11** The burning properties and antipersonnel effect of plasticized white phosphorus. (Progress Report to September 15, 1944.) H. F. Johnstone, David G. Edwards and others. OEMsr-102; Service Project Nos. CWS-1 and CWS-27; OSRD No. 4733. University of Illinois. March 3, 1945.

- M12** Design of a plant for manufacturing and loading plasticized white phosphorus. E. A. Ford. OEMsr-102; Service Project Nos. CWS-1, CWS-27 and NO-292; OSRD No. 6122. University of Illinois. October 17, 1945.

- M13** The development of plasticized white phosphorus, PWP. Mark M. Woyski, E. A. Ford and others. OEMsr-102; Service Project Nos. CWS-1 and CWS-27; OSRD No. 6566. University of Illinois. January 28, 1946.

504.3 Solid Aerosols

- M1** Dispersal and persistence properties of solid aerosols. (Informal Report No. 10.2-9.) Victor K. LaMer, David Sinclair and others. OEMsr-148; Service Project No. CWS-1. Columbia University. November 12, 1943.

- M2** The preparation of solid materials for dispersion as aerosols. (Report to May 10, 1944.) F. C. McGrew. OEMsr-963; Service Project No. CWS-1; OSRD No. 3902. E. I. duPont de Nemours and Company, Inc. July 17, 1944.

- M3** Development of a thermal generator bomb for dispersing concentrated mustard aerosol. E. D. Shippee, M. H. Raila and Edward W. Comings. OEMsr-102; Service Project No. CWS-27; OSRD No. 6574. University of Illinois. February 4, 1946.

504.4 Miscellaneous Toxic Aerosols

- M1** Smoke production. (Report No. 47, to June 27, 1941.) Edward W. Comings. NDCrc-47; Service Project No. CWS-1; OSRD No. 109. University of Illinois. June 27, 1941.

- M2** Development of a smoke unit. (Final Report No. 105.) Edward W. Comings. NDCrc-47; Service Project No. CWS-1; OSRD No. 167. University of Illinois. November 5, 1941.

600 DDT

601 Physical Characteristics

601.1 Solubility

- M1** The solubility of DDT in mixtures of xylene and lubricating oil, 10-W. The density of these solu-

tions when saturated with DDT. (Informal Report No. 10.2-20.) Victor K. LaMer, Seymore Hochberg and Joseph Bethel. OEMsr-1388. Columbia University. April, 1945.

- M2** Sun Oil Company solvent Aro-sol, 151-B, as a practical solvent for DDT. (Informal Report No. 10.2-22.) Victor K. LaMer, Seymore Hochberg and Joseph Bethel. OEMsr-1388. Columbia University. April 30, 1945.

- M3** Effect of solvents on the toxicity of DDT aerosols. (Report No. 123.) Victor K. LaMer, Seymore Hochberg and others. OEMsr-1388; Service Project Nos. CWS-1, SG-6 and NM-100; OSRD No. 5936. Columbia University and US Department of Agriculture. August 31, 1945.

601.2 Particle Size

- M1** The optical characterization of any aerosol in the laboratory or field. The production of aerosols from powdered solid materials. (Report to October 31, 1944.) Victor K. LaMer, Jacob Q. Umberger and others. OEMsr-148; Service Project No. CWS-1; OSRD No. 4904. Columbia University. April 15, 1945.

- M2** Formulas utilizing DDT concentrate and/or Diesel oil for use in Army and Navy insecticidal aerosol generators. With notes on adult muscoid fly toxicity. (Report No. 120.) Victor K. LaMer, Frank Brescia and others. OEMsr-1388; Service Project Nos. CWS-1, SG-6 and NM-100; OSRD No. 5729. Columbia University. August 18, 1945.

602 Dispersal and Behavior of DDT

- M1** The production of aerosol droplets below twenty-five micron diameter for the dispersal of insecticides and chemical-warfare agents. (Informal Report No. 10.4-60.) R. L. LeTourneau, R. J. Kallal and D. R. Powell. Service Project No. CWS-26. University of Illinois. April 20, 1944.

602.1 Generators

602.11 Grounded

- M1** Mosquito control by ground dispersal of DDT as aerosol from large-scale generators. (Informal Report No. 10.2-19.) Ridsdale Ellis and Victor K. LaMer. OEMsr-148 and OEMsr-1388. Columbia University. December, 1944.

- M2** Conversion of Besler No. 374 screening smoke generator to a Hochberg-LaMer aerosol generator for insecticidal purposes. Supplement on conversion of Besler M-2 generator. (Report No. 53, to April 2, 1945.) Victor K. LaMer, Seymore Hochberg and others. OEMsr-1388; Service Project Nos. SG-6, CWS-1 and NM-100; OSRD No. 4894. Columbia University. April 5, 1945.

- M3** The Hochberg-LaMer aerosol generator. (Report No. 15, to October 31, 1944.) Victor K. LaMer and Seymore Hochberg. OEMsr-148 and OEMsr-1388; Service Project Nos. SG-6, CWS-1 and NM-

100; OSRD No. 4901. Columbia University. April 15, 1945.

- M4** The use in the South Pacific of the Navy screening smoke generator, M-374, converted to an insecticidal aerosol generator according to the Hochberg-LaMer principle. (Report No. 121 covering period from, October 12, 1944 to April 27, 1945.) Frank Brescia and Irwin B. Wilson. OEMsr-1388; Service Project Nos. CWS-1, SG-6 and NM-100; OSRD No. 5730. Columbia University. May 7, 1945.

602.12 Mobile

602.121 Airplane

- M1** Tests with an exhaust aerosol DDT generator on a 450-hp Stearman aircraft. (Progress Report to September 25, 1944.) R. L. LeTourneau, C. W. Kearns and others. OEMsr-102; Service Project Nos. CWS-1 and AC-108; OSRD No. 4399. University of Illinois. November 29, 1944.

- M2** The development of an aerosol generator for dispersing DDT solutions from the exhaust of an aircraft engine. (Report No. 95, to June 1, 1945.) H. F. Johnstone, R. J. Kallal and C. H. Adams. OEMsr-102; Service Project Nos. SG-6, CWS-1 and others; OSRD No. 5309. University of Illinois. July 5, 1945.

- M3** Exhaust aerosol generator for dispersal of DDT solution with SB2C-4 airplane. (Report No. 114.) J. H. Clark. OEMsr-1446; Service Project Nos. CWS-1, NM-100 and SG-6; OSRD No. 5487. Solar Aircraft Company. August 25, 1945.

- M4** Exhaust aerosol generator on the PBJ-1H for the dispersal of DDT and oil smoke. (Report No. 115.) J. H. Clark. OEMsr-1446; Service Project Nos. CWS-1, SG-6 and NM-100; OSRD No. 5510. Solar Aircraft Company. August 30, 1945.

- M5** Some theoretical aspects of the behavior of DDT aerosols dispersed from aircraft. (Report No. 116.) H. F. Johnstone, Warren E. Winsche and others. OEMsr-102; Service Project Nos. CWS-1 and SG-6; OSRD No. 5710. University of Illinois. September 19, 1945.

- M6** The development of an exhaust DDT aerosol generator for the Taylorcraft light airplane. (Report No. 144.) R. I. Rice. OEMsr-102; Service Project Nos. CWS-1, AC-108 and NM-100; OSRD No. 6344. University of Illinois. November 23, 1945.

602.122 Vehicle

- M1** Directions for installation and operation of exhaust-type aerosol generator on jeep. (Informal Report No. 10.4-83.) R. I. Rice and H. F. Hrubecky. OEMsr-102; Service Project Nos. CWS-1 and AC-108. University of Illinois. May 1, 1945.

- M2** Installation of an exhaust DDT aerosol generator on the cargo carrier, M-29C (Weasel). (Informal Report No. 10.4-84.) R. I. Rice. OEMsr-102; Service Project Nos. CWS-1 and NM-100. University of Illinois. July 20, 1945.

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- M3** Development of an exhaust DDT aerosol generator for the 1/4 ton, 4 x 4 truck, jeep. (Report No. 139.) R. L. LeTourneau, R. I. Rice and others. OEMsr-102; Service Project Nos. CWS-1 and NM-100; OSRD No. 6301. University of Illinois. November 7, 1945.
- 602.2 Toxicity Tests**
- M1** The toxicity of DDT films and aerosol deposits. (Informal Report No. 10.4-74.) R. L. LeTourneau, C. W. Kearns and others. OEMsr-102 and OEMsr-108; Service Project No. CWS-27. University of Illinois. October 1, 1944.
- 602.21 Mosquitoes**
- M1** Toxicity of DDT to mosquitoes. Effect of particle size on the efficiency of oil aerosols bearing DDT. (Progress Report to October, 1944.) Victor K. LaMer, Seymore Hochberg and others. OEMsr-148; OSRD No. 4447. Columbia University. December 11, 1944.
- M2** Statistical considerations in the use of DDT aerosols. (Report No. 13, to January 1, 1945.) W. H. Rodebush. OEMsr-108; Service Project Nos. CWS-1 and SG-6; OSRD No. 4757. University of Illinois. March 5, 1945.
- M3** Test of large area mosquito control using the inventors' model of the Hochberg-LaMer aerosol generator in Lodge Village, Georgetown, B. G., on April 12, 1945. (Report No. 96.) Kenneth C. Hodges and John C. Rowell. OEMsr-1388; Service Project Nos. SG-6, CWS-1 and NM-100; OSRD No. 5310. Columbia University. July 5, 1945.
- M4** The effect of particle size and speed of motion of DDT aerosols of uniform particle size in a wind tunnel on the mortality of mosquitoes. (Report No. 119.) Randall Latta, Victor K. LaMer and others. OEMsr-1388; Service Project Nos. CWS-1, SG-6 and NM-100; OSRD No. 5566. Columbia University and US Department of Agriculture. September 7, 1945.
- M5** Salt marsh and anopheline mosquito field control tests with the Hochberg-LaMer insecticidal generator using oil DDT aerosols. (Report No. 122.) Victor K. LaMer, Frank Brescia and others. OEMsr-1388; Service Project Nos. CWS-1, SG-6 and NM-100; OSRD No. 5731. Columbia University. September 18, 1945.
- M6** Field tests of Hochberg-LaMer aerosol insecticide generator against salt marsh mosquitoes at Man-
toloking, N. J., July 19 and August 24, 1945. (Informal Report No. 10.2-23.) Victor K. LaMer, Seymore Hochberg and others. OEMsr-1388; Service Project Nos. CWS-1 and SG-6. Columbia University. October 23, 1945.
- 602.22 Drosophila**
- M1** Toxicity to drosophila (fruit flies) of DDT deposited from aerosols on the surface of certain leaves and glass. (Informal Report No. 10.2-18.) Victor K. LaMer, Seymore Hochberg and others. OEMsr-148. Columbia University. December 7, 1944.
- M2** Toxicity to drosophila (fruit flies) of aerosols of DDT of uniform droplet size in oil of high boiling point. (Report No. 14, to October 31, 1944.) Victor K. LaMer, Seymore Hochberg and others. OEMsr-148; Service Project Nos. SG-6 and CWS-1; OSRD No. 4796. Columbia University. March 15, 1945.
- 602.23 Miscellaneous Tests**
- M1** Cankerworms as test insects for DDT field tests of models of the Hochberg-LaMer insecticidal aerosol generator at Hempstead Lake State Park, Long Island, New York. (Report No. 124.) Victor K. LaMer, Seymore Hochberg and others. OEMsr-1388; Service Project Nos. CWS-1 and SG-6; OSRD No. 6004. Columbia University. September 28, 1945.
- M2** Laboratory experiments testing effects of DDT on wood tick, *Dermacentor variabilis*. (Informal Report No. 10.2-24.) Victor K. LaMer, Seymore Hochberg and others. OEMsr-1388; Service Project Nos. CWS-1 and SG-6. Columbia University. October 23, 1945.
- M3** Efficacy of DDT and DNOC as insecticides for grasshoppers when dispersed by a Hochberg-LaMer type aerosol generator. (Informal Report No. 10.2-25.) Victor K. LaMer. OEMsr-1388; Service Project Nos. CWS-1 and SG-6. Columbia University. October 25, 1945.
- M4** Black fly control with DDT oil aerosols using the Hochberg-LaMer generator with notes on spruce bud worm and larch case bearer control at Lake Placid, New York, June, 1945. (Informal Report No. 10.2-26.) Victor K. LaMer. OEMsr-1388; Service Project Nos. CWS-1 and SG-6. Columbia University. November 8, 1945.

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- M1** Final report of NDRC Oxygen Reviewing Committee. T. R. Chilton, Harry A. Curtis and others. December 22, 1941.
- M2** The investigations carried out under Contract No. OEMsr-232 and new contract, Symbol No. 964 with Yale University. (Reports for March and April, 1942.) Barnett F. Dodge. OEMsr-232. Yale University.
- M3** The investigations carried out under Contract No. OEMsr-355 with Yale University. (Reports covering the period from June, 1942 to June, 1943.) Barnett F. Dodge. Yale University.
- M4** The Oxygen Technical Committee. Morning meeting, August 20, 1942. (n.a.) [August, 1942.]
- M5** Oxygen units under development by the National Defense Research Committee. S. S. Prentiss. August 14, 1942.
- M6** Oxygen units under development by the National Defense Research Committee. (n.a.) January 1, 1943.
- M7** Central Engineering Laboratory, NDRC, Section 11.1, Oxygen. (Reports covering the period from March 15, 1943 to April 30, 1945.) J. H. Rushton, Barnett F. Dodge and others. OEMsr-934. University of Pennsylvania.
- M8** Production progress of oxygen producing units. (Monthly Report [for the period] from March 15 to April 15, 1943.) R. R. Enders. NDCrc-830. Servel, Inc. April, 1943.
- M9** Final report of the Central Engineering Laboratory, University of Pennsylvania, for the period March, 1943 through June, 1945. John A. Goff and Roy W. Banwell. OEMsr-934; Service Project Nos. NL-B42, NA-106 and others; OSRD No. 5482. University of Pennsylvania. June 30, 1945.

102 Generation of Oxygen

- M1** [Various oxygen producing units.] (Progress Reports covering period from April, 1942 to April, 1943.) Walter E. Lobo. M. W. Kellogg Company.
- M2** [Trailer Unit for producing oxygen.] Contract NDCrc-206 with Air Reduction Company. (Progress Report [for] August [1942].) Wolcott Dennis. NDCrc-206. Air Reduction Company, Inc. August [1942].
- M3** [The] oxygen program [of] Section 11.3, including bi-monthly report for December, 1942 and January, 1943 [prepared] for [a] meeting with NDRC Reviewing Committee. (n.a.) February 13, 1943.
- M4** Oxygen plant development. (Report to February 28, 1945.) Walter E. Lobo. OEMsr-365; Service

Project Nos. NA-11, NS-115 and others; OSRD No. 4555. M. W. Kellogg Company. February 28, 1945.

- M5** Oxygen generating equipment. (Report to June 30, 1945.) Frederick G. Keyes. NDCrc-182; Service Project Nos. NS-115, NA-111 and others; OSRD No. 5329. Massachusetts Institute of Technology.

102.1 Mechanical Methods

- M1** The development of a low-temperature engine compressor rectifier unit for the separation of oxygen from air. Frederick G. Keyes and S. C. Collins. September 12, 1941.
- M2** [Various oxygen producing units.] (Monthly Progress Reports covering the period from March, 1942, April, 1943 to January, 1944.) Walter E. Lobo. M. W. Kellogg Company.
- M3** Oxygen project, NDCrc-182. (Special Report No. 4.) Frederick G. Keyes. NDCrc-182. [Massachusetts Institute of Technology.] April 15, 1942.
- M4** [Various oxygen producing units.] (Progress Reports [covering the period from] July, September [and] October, 1942.) Wolcott Dennis. NDCrc-206. Air Reduction Company, Inc.
- M5** [Various oxygen producing units.] (Progress Report [on] NDRC Contract No. NDCrc-206 [with the] Air Reduction Company [for the period] November 15 [to] December 31, 1943.) Wolcott Dennis. Air Reduction Company, Inc. December, 1943.
- M6** Visit to [the] Air Reduction Sales Company, December 15 and 16, 1943. George T. Skaperdas. [December] 1943.
- M7** Report covering consulting services of Dr. Howard O. McMahon to [the] E. B. Badger and Sons Company in connection with mechanical oxygen generators. T. L. Wheeler and Howard O. McMahon. Arthur D. Little, Inc. March 6, 1944.
- M8** Mechanical oxygen generating units and related equipment. J. N. MacKendrick and A. Van Campen. OEMsr-370; Service Project Nos. AC-12, NA-111 and others; OSRD No. 4792. Clark Brothers Company, Inc. May 15, 1945.

102.11 Small Units

- M1** Conference on small oxygen units. C. C. Furnas. M. W. Kellogg Company. July 13, 1942.

102.111 Airborne Units

- M1** Airplane oxygen unit. (n.a.) NDCrc-182. [Massachusetts Institute of Technology.] June 27, 1942.
- M2** Oxygen producer, designed and built by S. C. Collins at Research Laboratory of Physical Chemistry, Massachusetts Institute of Technology. (Special Report No. 12.) Frederick G. Keyes. NDCrc-

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182. Massachusetts Institute of Technology. September 25, 1942.

- M3** Instructions for operating the Mond-Ricardo British oxygen gas producer. Appendix of memoranda pertaining to its construction, servicing and maintenance. Frederick G. Keyes. Massachusetts Institute of Technology. September 28, 1942.
- M4** Oxygen problem. (Report No. LVII.) Clifford Hach, Ross Curtis and Harvey Diehl. OEMsr-215. [Iowa State College.] December 15, 1942.
- M5** Letter to Earl P. Stevenson. Subject: Design of aircraft unit. W. E. Catterall and J. C. Harper. Massachusetts Institute of Technology. February 19, 1943.
- M6** The Collins automatic airborne low-pressure oxygen unit. D. C. Reams, Jr. Central Engineering Laboratory. June 5, 1944.
- M7** A light-weight, automatic, mechanical oxygen generator. (Report to May 31, 1944.) S. C. Collins and Howard O. McMahon. NDCrc-182; Service Project Nos. AC-12, NS-116 and CE-29; OSRD No. 3800. Massachusetts Institute of Technology. June 19, 1944.

102.12 Mobile Units

- M1** Informal comments requested by the M. W. Kellogg Company on provisional design of oxygen units. W. F. Giauque. NDCrc-198. University of California. May 15, 1942.
- M2** Outline of proposed low-temperature trailer mounted oxygen unit for NDRC. (Monthly Report for June, 1942.) W. F. Giauque. NDCrc-198. University of California. [June 15, 1942.]
- M3** Skid-mounted oxygen plant designed and built by the Research Laboratory of the Air Reduction Company, Inc., Stamford, Connecticut. Wolcott Dennis. NDCrc-206. Air Reduction Company, Inc. June 15, 1943.
- M4** Low-pressure mobile gaseous oxygen units developed for the National Defense Research Committee at Olean, New York. (n.a.) Clark Brothers Company, Inc. and M. W. Kellogg Company. October 29, 1943.
- M5** [A skid-mounted oxygen plant.] (Progress Report on NDRC Contract No. NDCrc-206. Wolcott Dennis. Air Reduction Company, Inc. November 15, 1943.
- M6** Observation of air reduction in NDRC skid unit on December 6, 1943. George T. Skaperdas. December, 1943.
- M7** Mobile oxygen-nitrogen generating units. (Technical Manual No. 5-355.) (n.a.) US War Department. January 14, 1944.

102.13 Expanders

- M1** The development of 1700-cfm low-temperature expander. (Progress Reports [for the period from July 1, 1942 to December 15, 1943.] Judson S. Swearingen. Elliott Company.
- M2** Letter to S. S. Prentiss. Subject: Expander casing

and compressor. J. R. McDermet. Elliott Company. August 7, 1942.

- M3** Tests of performance of the Collins-type expansion engine built by Clark Brothers Company, Inc. (Report to January 26, 1944.) J. G. Aston. OEMsr-685; Service Project Nos. AC-12, NA-111 and CE-29; OSRD No. 3482. Pennsylvania State College. April 14, 1944.
- M4** The design and building of two sizes of turbo expanders. (n.a.) OEMsr-666; Service Project No. NS-115; OSRD No. 6670. Sharples Corporation. May 24, 1946.

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102.141 Air

- M1** Letter to C. C. Furnas. Subject: Portable compressor program. (Progress Report [for period from early February to April 15, 1942.] J. N. MacKendrick. OEMsr-370. Clark Brothers Company, Inc. April 15, 1942.
- M2** Letter to C. C. Furnas. Subject: Portable compressor program. (Progress Report [for period from April 15 to May 15, 1942.] J. N. MacKendrick. OEMsr-370. Clark Brothers Company, Inc. May 15, 1942.
- M3** Small Hapeg compressors. (Report No. 14.) Judson S. Swearingen. Elliott Company. September 19, 1942.
- M4** Letter to C. C. Furnas. Subject: Portable compressor program. J. N. MacKendrick. OEMsr-370. Clark Brothers Company, Inc. September 19, 1942.
- M5** Portable compressor program. (Progress Report [to November 30, 1942.] (n.a.) OEMsr-370. Clark Brothers Company, Inc. [December, 1942.]
- M6** Letter to Earl P. Stevenson. Subject: Portable compressor program. J. N. MacKendrick and A. Van Campen. OEMsr-370. Clark Brothers Company, Inc. June 1, 1943.
- M7** Letter to Earl P. Stevenson. Subject: Portable compressor program. J. N. MacKendrick and A. Van Campen. OEMsr-370. Clark Brothers Company, Inc. July 20, 1943.
- M8** Letter to Earl P. Stevenson. Subject: Portable compressor program. J. N. MacKendrick and A. Van Campen. OEMsr-370. Clark Brothers Company, Inc. September 25, 1943.
- M9** Testing of the 200-cfm Elliott-Lysholm two-stage compressor. (Report No. 28.) Truk Dirk Graff (?) OEMsr-370. Elliott Company. December 9, 1943.
- M10** Clark 4-stage, 3000 pounds [per] square inch compressor used in liquid oxygen trailer unit. W. F. Giauque. NDCrc-198. University of California. January 27, 1944.
- M11** Letter to Earl P. Stevenson. Subject: Portable compressor program. J. N. MacKendrick and A. Van Campen. OEMsr-370. Clark Brothers Company, Inc. February 15, 1944.

M12 Letter to Earl P. Stevenson. Subject: Portable compressor program. J. N. MacKendrick and A. Van Campen. OEMsr-370. Clark Brothers Company, Inc. June 1, 1944.

M13 Performance of M-7AT radiators. Eugene Miller. OEMsr-365. M. W. Kellogg Company. April 16, 1945.

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M1 Clark 2-stage 5" x 3" x 3½" dry oxygen compressor. (n.a.) Clark Brothers Company, Inc. [October 15, 1943.]

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M1 Heats of vaporization, O₂-N₂. J. G. Aston, S. C. Schumann and others. M. W. Kellogg Company. May 15, 1943.

M2 Technical data [with respect to the properties of air.] Walter E. Lobo. OEMsr-365. M. W. Kellogg Company. August 24, 1944.

102.2 Chemical Methods

M1 Investigation of oxygen supply. (Progress Report No. 135, to November 1, 1941.) E. R. Gilliland. OSRD No. 291. Massachusetts Institute of Technology. December 8, 1941.

M2 [Various oxygen producing units.] (Kellogg Monthly Progress Report [covering the period from] December 15, 1942 to January 15, 1943.) Walter E. Lobo. M. W. Kellogg Company. January 21, 1943.

102.21 Regenerative

M1 Investigation of oxygen supply. R. D. McCrosky and W. E. Catterall. Massachusetts Institute of Technology. February, 1942.

M2 Investigation of oxygen supply. (Monthly Reports [covering the period from] February, 1942 to June 15, 1943.) R. D. McCrosky, W. E. Catterall and others. Massachusetts Institute of Technology.

M3 Production of oxygen by regenerative chemicals. W. W. Beck. August 19, 1942.

M4 Apparatus for the determination of the rate of oxygenation. (Report No. 57 [covering the period] from October 20, 1942 to January 20, 1943.) George R. Harrison, Richard Brouns and Harvey Diehl. OEMsr-215. [Iowa State College.] February 16, 1943.

M5 Regenerative chemical field medical unit. W. E. Catterall and Charles R. Hetherington. Massachusetts Institute of Technology. May 6, 1943.

M6 The regenerative chemical system for oxygen production on board aircraft. (Report to July 1, 1943.) J. P. Longwell and W. E. Catterall. OEMsr-4; Service Project No. NL-B42; OSRD No. 1620. Massachusetts Institute of Technology. July 19, 1943.

M7 Instructions for operation and maintenance of [the] NDRC regenerative oxygen unit. (n.a.) October 1, 1943.

102.211 Chelate Compounds

M1 Chelate compounds. T. Tsumaki. *Bulletin of the Chemical Society of Japan*, Volume 13, 1938. pp. 252-260.

M2 Oxygen problem. (Summary of Report Nos. 1-7, 12, 17, 21, 23-24, 26-29, 31-35, 37-42, 44-45, 47-55, 58-60, 62-66, 69-70, 74, 76-77 [covering period from] October 20, 1938 to May 14, 1943.) Clifford Hach, Harvey Diehl and others. Iowa State College and other institutions.

M3 The production of oxygen by the use of a regenerative chemical. (Report No. 64.) Wendell M. Latimer. NDCrc-129; Service Project Nos. AC-12 and NL-B6a. University of California. August 25, 1941.

M4 Manufacture of oxygen by use of regenerative chemicals. (Report No. 186, to December, 1941.) Melvin Calvin. [NDCrc-129;] OSRD No. 403. University of California. December 29, 1941.

M5 Development of test unit for production of oxygen by a regenerative chemical. (Progress Report for December [1941].) (n.a.) Arthur D. Little, Inc. February 2, 1942.

M6 Chelate compounds [for] oxygen production and storage. Melvin Calvin. [University of California.] March 11, 1942.

M7 Letter to Earl P. Stevenson. Subject: Chelate compounds. ([Report for] March 15, 1942.) T. A. Geissman. Research Project No. B-228. [University of California at Los Angeles.] March 14, 1942.

M8 [Chelate compounds.] (Monthly Reports [for the period from] March 15, 1942 to July 1, 1943.) T. A. Geissman, William G. Young and others. Research Project No. B-228. University of California at Los Angeles.

M9 Chelate oxygen compounds. (Monthly Reports [for the period from] April 15, 1942 to July, 1943.) Melvin Calvin, W. K. Wilmarth and others. OEMsr-279. University of California.

M10 Chelate oxygen compounds and equipment for their use. (Report No. 378, to August 1, 1942.) Melvin Calvin. OEMsr-279; Project Nos. AC-12, NL-B42 and B-213; OSRD No. 921. University of California. September 30, 1942.

M11 Development of oxygen-carrying compounds. (Report No. 396, to September 1, 1942.) Harvey Diehl. OEMsr-215; Project Nos. NL-B42 and B-225; OSRD No. 945. Iowa State College. October 16, 1942.

M12 Chelate oxygen compounds and the mechanism of the absorption reaction. (Report No. 398, to September 1, 1942.) Melvin Calvin. OEMsr-279; Project Nos. NL-B42, AC-12 and B-213a; OSRD No. 1018. University of California. October 21, 1942.

M13 The progress of the research on salcomine and related compounds. (Reports [covering the period from] November, 1942 to April 15, 1943.) Karl A. Holst. Rumford Chemical Works.

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- M14** Manganese absorbents in the production of oxygen from air. (n.a.) [E. I. duPont de Nemours and Company, Inc.] December, 1942.
- M15** Development of test unit for production of oxygen by a regenerative chemical. (Progress Reports [covering the period from] January, 1943 to August 15, 1943.) T. L. Wheeler and Benjamin Fogler. Arthur D. Little, Inc.
- M16** [The preparation of o-ethavan.] (Monthly Reports [covering the period from] February 10 to May 15, 1943.) O. J. Weinkauff. Monsanto Chemical Company.
- M17** Chelate compounds for oxygen production. (Summary Report [covering the period from] February 1 to March 1, 1943.) Melvin Calvin. OEMsr-279. University of California. March, 1943.
- M18** Absorption rate determinations using small samples. [Benjamin Fogler(?)] OEMsr-269. Arthur D. Little, Inc. March 17, 1943.
- M19** Adaptability of mixed base chelate compounds to adiabatic operation. Charles R. Hetherington and W. E. Catterall. Massachusetts Institute of Technology. March 29, 1943.
- M20** Further studies on the deterioration of ethomine and salcomine. W. E. Catterall and A. M. Smith. Massachusetts Institute of Technology. April 2, 1943.
- M21** [Chelate compounds.] (Monthly Reports [covering period from] April 15 to June 15, 1943.) Karl A. Holst. Rumford Chemical Works.
- M22** [Chelate compounds.] (Report for the month of May [1943].) (n.a.) Research Project No. B-228. University of California at Los Angeles. May, 1943.
- M23** Development of oxygen-carrying chemicals. (Part III. Progress Report covering period [from] September 1, 1942 to April 20, 1943.) Harvey Diehl. OEMsr-215; Service Project No. NL-B42; OSRD No. 1448. Iowa State College. May 24, 1943.
- M24** Properties of salcomine and ethomine and the separation of atmospheric oxygen therewith. A. M. Smith and W. E. Catterall. OEMsr-4; Service Project No. NL-B42; OSRD No. 1539. Massachusetts Institute of Technology. June 25, 1943.
- M25** Special engineering systems utilizing chelate chemical absorbents for oxygen production. (Progress Report to July 1, 1943.) Charles R. Hetherington and W. E. Catterall. OEMsr-4; OSRD No. 1579. Massachusetts Institute of Technology. July 9, 1943.
- M26** Studies on the deterioration of ethomine. (Report [covering period from] June 1 to September 1, 1943.) John D. Roberts and R. O. Clinton. Research Project No. B-228. University of California at Los Angeles. [September, 1943.]
- M27** Tentative process for o-ethavan. L. P. Kyrides, H. Anthes and others. Monsanto Chemical Company. September 21, 1943.
- M28** Development of oxygen-carrying chemicals. A circulating solid apparatus for the manufacture of oxygen. (Fourth Progress Report, No. 73, covering the period [from] May 20, 1942 to May 20, 1943.) Clifford Hach and Harvey Diehl. OEMsr-215; Service Project No. NL-B42; OSRD No. 1913. Iowa State College. October 13, 1943.
- M29** Development of oxygen-carrying chemicals. (Fifth and Final Progress Report, No. 79, covering period [from] April 20, 1943 to June 30, 1943.) Harvey Diehl. OEMsr-215; Service Project No. NL-B42; OSRD No. 1850. Iowa State College. October 13, 1943.
- M30** The laboratory preparation of 3-fluorosalicylaldehyde with suggestions for pilot plant production. L. Ferguson, R. Holmes and others. OEMsr-279. [University of California.] October 15, 1943.
- M31** The manufacture of 50 lbs of 3-F-salicylaldehyde. Melvin Calvin. OEMsr-279. [University of California.] December 9, 1943.
- M32** The effect of salcomine on workmen, with summaries of physical examinations. (n.a.) OEMsr-269; Service Project Nos. NL-B42, AC-12 and CE-29. Arthur D. Little, Inc. February 1, 1944.
- M33** The forms and methods of preparation of cobalt bis-(3-fluorosalicylaldehyde)-ethylenediimine. R. H. Bailes and Melvin Calvin. OEMsr-279. University of California. February 1, 1944.
- M34** The crystal structure of the cobalt chelates and the mechanism of the oxygenation process. E. W. Hughes, C. H. Barkelew and Melvin Calvin. OEMsr-279. [University of California.] March 15, 1944.
- M35** Development of a test unit for production of oxygen by a regenerative chemical. (Report to January 31, 1944.) T. L. Wheeler and Benjamin Fogler. OEMsr-269; OSRD No. 3359. [Arthur D. Little, Inc.] March 17, 1944.
- M36** The development of a method for preparing large quantities of fluomine. (Informal Report [covering period from] February 1 to March 24, 1944.) Karl A. Holst. Rumford Chemical Works. March 24, 1944.
- M37** The preparation of 75 lbs of 3-fluorosalicylaldehyde and 20 lbs of the active cobalt chelate. Melvin Calvin, L. Ferguson and others. OEMsr-279. University of California. April 10, 1944.
- M38** Catalogue of X-ray powder diagrams of a number of pertinent cobalt chelate compounds. E. W. Hughes and Melvin Calvin. OEMsr-279. University of California. April 28, 1944.
- M39** Oxygen-carrying chelate compounds. (Progress Report [covering period] from June 1 to August 31, 1944.) Melvin Calvin. OEMsr-279. University of California. [August, 1944.]
- M40** Preparation of disalicylaltetrafluoroethylenediamine. (Monthly Progress Report covering period [from] July 1 to August 4, 1944.) Frederick S. Bacon. OEMsr-934. University of Pennsylvania. August 7, 1944.
- M41** The development, properties and use of chelate compounds for the production of oxygen. (Report

to August 31, 1944.) Melvin Calvin. OEMsr-279; OSRD No. 4161. University of California. September 23, 1944.

M42 Preparation of intermediates for oxygen-carrying chelate complexes. (Report to March 1, 1945.) T. A. Geissman, William G. Young and others. OEMsr-395; Service Project Nos. NL-B42 and NS-117; OSRD No. 4845. University of California at Los Angeles. March 23, 1945.

M43 Characteristics of the oxygen absorbents ethomine and fluomine. (Report to June 30, 1945.) Robert L. Von Berg. OEMsr-4; Service Project Nos. NL-B42 and NS-117; OSRD No. 5407. Massachusetts Institute of Technology. July 31, 1945.

M44 Production of salcomine and related compounds. (Report to September 4, 1945.) Karl A. Holst. OEMsr-605; Service Project Nos. NL-B42 and NS-117; OSRD No. 6052. Rumford Chemical Works. October 1, 1945.

102.212 Salcomine

M1 Salcomine. (Monthly Reports [covering period from] April 15, 1942 to August 15, 1942.) T. A. Geissman and William G. Young. Research Project No. B-228. University of California at Los Angeles.

M2 Salcomine. (Brief summaries of investigations covering period from June, 1942 to March 12, 1943.) E. P. Bartlett, A. G. Weber and others. E. I. duPont de Nemours and Company, Inc.

M3 Investigation of oxygen supply. (Report No. 258 [covering period to May 31, 1942].) E. R. Gilliland. OEMsr-4; Project Nos. AC-12 and B-69; OSRD No. 613. Massachusetts Institute of Technology. June 8, 1942.

M4 Investigation of oxygen supply. (Monthly Reports covering period from July, 1942 to August 31, 1942.) W. E. Catterall, A. M. Smith and others. Massachusetts Institute of Technology.

M5 The activities of the Rumford Research Laboratory in connection with the development and production of salcomine. (Report [covering period] from December 5, 1941 to July 1, 1942.) Karl A. Holst. Rumford Chemical Works. July 6, 1942.

M6 Oil suspension salcomine process as developed by the Ammonia Department of the duPont Company. (n.a.) M. W. Kellogg Company. August 5, 1942.

M7 Salcomine deterioration. C. D. Bell and E. Field. E. I. duPont de Nemours and Company, Inc. [September 1942(?)]

M8 Investigation of oxygen supply. (Monthly Report for October, 1942.) W. E. Catterall, A. M. Smith and others. OEMsr-4. [Massachusetts Institute of Technology.] October, 1942.

M9 The progress of the research on salcomine and related compounds. (Report for September, 1942.) Karl A. Holst. Rumford Chemical Works. October 15, 1942.

M10 The progress of the research on salcomine and

related compounds. (Report for October, 1942.) Karl A. Holst. [Rumford Chemical Works.] November 12, 1942.

M11 The preparation and properties of mixed aldehyde cobalt derivatives. Karl A. Holst. Rumford Chemical Works. January 16, 1943.

M12 [Salcomine.] (Monthly Report [covering period from] June 15 to July 15, 1943.) Robert L. Von Berg. Massachusetts Institute of Technology. [July, 1943.]

M13 Salcomine as an absorbent for separating atmospheric oxygen. E. Field, C. D. Bell and J. V. E. Hardy. OEMsr-604; Service Project No. NL-B42; OSRD No. 1616. E. I. duPont de Nemours and Company, Inc. July 16, 1943.

M14 Studies on the deterioration of salcomine. (Report [covering period from] August 1 to October 1, 1943.) John D. Roberts and R. O. Clinton. Research Project No. B-228. University of California at Los Angeles. [October, 1943.]

M15 Analysis and degradation study of salcomine. (Final Report to October 1, 1943.) (n.a.) OEMsr-604; Service Project No. NL-B42; OSRD No. 1951. E. I. duPont de Nemours and Company, Inc. October 25, 1943.

M16 The salcomine poisoning of Dr. T. A. Geissman. Roy W. Banwell. University of Pennsylvania. [January, 1945(?)]

M17 Oxygen-carrying metallic complexes of the salcomine type. T. A. Geissman. OEMsr-934. University of Pennsylvania. June 30, 1945.

M18 A re-evaluation of the toxicity of salcomine. (Excerpt from NDRC Informal Monthly Progress Report No. 9-4-1-21, October 10, 1944.) (n.a.) (n.d.)

102.213 Test Units

M1 Experimental finned tube unit. (Informal Monthly Progress Report for January, 1942.) E. R. Gilliland, R. D. McCrosky and W. E. Catterall. [Massachusetts Institute of Technology.] [January, 1942.]

M2 [The] Lobo unit. (Reports for the months of August, October and November, 1942.) F. H. Wells and W. S. Gleeson. American Machine Defense Corporation.

M3 Oxygen equipment [development under] Contract No. OEMsr-499. (Monthly Report for December, 1942.) F. H. Wells. OEMsr-499. American Machine Defense Corporation. January 5, 1943.

M4 Development of test unit for production of oxygen by a regenerative chemical. (Progress Reports covering the period from August 15, 1943 to March 15, 1945.) T. L. Wheeler and Benjamin Fogler. OEMsr-269. Arthur D. Little, Inc.

M5 Oxygen plant development employing regenerative chemicals. (Report to March 16, 1945.) Walter E. Lobo and C. Bockius. OEMsr-365 and OEMsr-499; Service Project Nos. NL-B42 and NS-117; OSRD No. 5154. M. W. Kellogg Company and

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American Machine Defense Corporation. May 31, 1945.

102.22 Non-Regenerative

M1 Non-regenerative chemical methods of producing oxygen. S. S. Prentiss. October 6, 1942.

102.221 Peroxides

M1 Generation of oxygen from alkali peroxides. S. S. Prentiss. Service Project No. CE-29; OSRD No. 1722. August 24, 1943.

M2 Peroxide oxygen generator. (Final Report to October 1, 1943.) Walter M. Buehl and John E. Seubert. OEMsr-863; Service Project No. CE-29; OSRD No. 1948. E. I. duPont de Nemours and Company, Inc. October 25, 1943.

M3 Stability and concentration of hydrogen peroxide. Frederick G. Keyes, Walter C. Schumb and D. B. Broughton. OEMsr-1453; OSRD No. 5385. Massachusetts Institute of Technology. August 1, 1945.

M4 Hydrogen peroxide. H. S. Gardner and T. K. Sherwood. OEMsr-1453; OSRD No. 5448. Massachusetts Institute of Technology. August 17, 1945.

M5 Laboratory study of the possibilities of commercial synthesis of hydrogen peroxide by electrical and photochemical methods. W. H. Rodebush, C. R. Keizer and others. OEMsr-1452; OSRD No. 6644. University of Illinois. March 25, 1946.

102.222 Rebreathers

M1 A survey of oxygen rebreathers. (Letter of transmittal and report.) Don M. Yost. Research Project No. B-6. Northwestern University. August 25, 1942.

M2 Nitrogen elimination in the high-altitude rebreather. Don M. Yost, Don S. Martin, Jr. and others. Northwestern University. November 15, 1942.

M3 Nitrogen elimination in the Navy high-altitude rebreather. (Division 10. Informal Report No. 10.1-35.) Don M. Yost, Don S. Martin, Jr. and others. OEMsr-282. Northwestern University. November 15, 1943.

102.223 Candles

M1 Chlorate oxygen candles. S. S. Prentiss. December 17, 1943.

M2 Development of oxygen candle apparatus for use in aircraft. John R. Pappenheimer. OEMcmr-26 and others. University of Pennsylvania, US Naval Research Laboratory and other institutions. [1945(?)]

103 Liquid Oxygen

103.1 Production Problems

M1 [The] liquid oxygen problem. (Report [covering period from] May 1 to June 30, 1941.) W. F. Giauque. University of California. [June, 1941.]

M2 Small portable plants for the production of liquid

oxygen. Barnett F. Dodge. NDCrc-80. Yale University. [June 14, 1941.]

M3 The production of liquid oxygen. Barnett F. Dodge and Harding Bliss. NDCrc-80. Yale University. August 1, 1941.

M4 Processes for the manufacture of liquid oxygen from air. Harding Bliss. Yale University. January 15, 1942.

M5 A brief comparison of low-temperature cycles for producing liquid oxygen from air. Barnett F. Dodge. [Yale University.] February 15, 1942.

M6 High-pressure liquid oxygen plant, originally intended as cascade system, as erected by Dr. W. F. Giauque. L. S. Twomey. NDCrc-198. University of California. April 26, 1944.

M7 Liquid oxygen trailer unit. (Report to July 25, 1944.) W. F. Giauque. NDCrc-198; Service Project No. NA-111; OSRD No. 4141. University of California. September 19, 1944.

103.2 Pumps

M1 Design and test of hand-operated liquid oxygen pump for charging high-pressure cylinders. T. L. Wheeler and Allen Latham, Jr. OEMsr-269. Arthur D. Little, Inc. September 2, 1943.

M2 Liquid oxygen pump. Frederick G. Keyes. NDCrc-182. Massachusetts Institute of Technology. November 17, 1943.

M3 Liquid oxygen pump and vaporizer. (Report to May 15, 1945.) T. L. Wheeler and Allen Latham, Jr. OEMsr-269; Service Project No. NA-106; OSRD No. 5152. Arthur D. Little, Inc. May 31, 1945.

103.3 Shipboard Units

M1 [Shipboard oxygen liquid unit.] (Report No. 1826.) Wolcott Dennis and W. G. Fogg. NDCrc-206. Air Reduction Company, Inc. June 1, 1942.

M2 [M-5 and M-6 liquid oxygen units.] Report of progress under Contract OEMsr-654. J. F. Pritchard. OEMsr-654. J. F. Pritchard and Company. December 14, 1942.

M3 [The] Joule-Thomson type liquid oxygen unit. T. L. Wheeler and Allen Latham, Jr. OEMsr-269. Arthur D. Little, Inc. June 16, 1943.

M4 Massachusetts Institute of Technology oxygen producing units. Frederick G. Keyes. NDCrc-182. Massachusetts Institute of Technology. December 17, 1943.

M5 Operating instructions for the Massachusetts Institute of Technology Model S unit for producing liquefied oxygen for respiratory use on submarines and other purposes. Dudley A. Williams. Massachusetts Institute of Technology. March 24, 1944.

M6 Shipboard liquid oxygen units. (Report to February 3, 1944.) T. L. Wheeler and Allen Latham, Jr. OEMsr-269; Service Project Nos. NA-111 and NS-115; OSRD No. 3369. Arthur D. Little, Inc. April 6, 1944.

M7 Development and production of Keyes-type liquid oxygen producers. (Final Report for the period

February 1, 1943 to March 31, 1944.) A. C. Shuart. OEMsr-914. Servel, Inc. June 15, 1944.

- M8** Oxygen processes. (Report to September 1, 1945.) (n.a.) NDCrc-206; Service Project Nos. NS-115 and NS-116; OSRD No. 5928. Air Reduction Company, Inc. October 1, 1945.

103.4 Air Separation Cycles

- M1** Information and diagrams of several air separation cycles. (Special Report No. 5.) Frederick G. Keyes. NDCrc-182. Massachusetts Institute of Technology. May 16, 1942.
- M2** Analysis of liquid air rectification cycles. (Report No. 315, to July 21, 1942.) Roger Adams and Harris M. Chadwell. OEMsr-454; Service Project No. NL-B42; OSRD No. 780. Linde Air Products Company. August 10, 1942.
- M3** Mobile oxygen units. Liquid air fractionation systems. Walter E. Lobo. M. W. Kellogg Company. February 3, 1943.
- M4** Analysis of low-temperature air separation and gas liquefaction cycles. (Report to January 1, 1943.) Barnett F. Dodge and Harding Bliss. OEMsr-232; Service Project No. NL-B6; OSRD No. 1424. Yale University. May 17, 1943.
- M5** Liquid air fractionation. (Progress Report, to May 15, 1944.) Walter E. Lobo and B. Williams. OEMsr-934; Service Project Nos. NA-111, NS-115 and others; OSRD No. 3768. M. W. Kellogg Company. June 13, 1944.
- M6** Vapor-liquid equilibrium for the system oxygen-nitrogen-argon. J. G. Aston. OEMsr-685 and OEMsr-934. Pennsylvania State College. December 7, 1944.
- M7** Experimental study of special equipment for use in low-temperature cycles for the production of liquid and gaseous oxygen. (Report to July 1, 1945.) Harding Bliss and Barnett F. Dodge. OEMsr-355; Service Project Nos. NA-111, NS-115 and others; OSRD No. 6302. Yale University. November 7, 1945.
- M8** The truck unit for air rectification designed and being built by W. F. Giauque at the University of California. (n.a.) University of California. (n.d.)

103.5 Converters and Vaporizers

- M1** The use of liquid oxygen for high-altitude flying. (Reprinted from the *Journal of the Aeronautical Sciences*, Volume 8, No. 9, July, 1941.) John D. Akerman. University of Minnesota. July, 1941.
- M2** Two Linde liquid oxygen evaporators submitted by Bureau of Aeronautics, Navy Department, Washington, D. C. on April 7, 1943. Lyman J. Briggs. National Bureau of Standards. May 18, 1943.
- M3** [Liquid oxygen pump.] J. P. Layton. BuAero Project No. 97/43. US Naval Engineering Experiment Station, Annapolis, Maryland. [August 17, 1943.]

- M4** Letter to Earl P. Stevenson. Subject: Low-pressure oxygen vaporizer. W. F. Giauque. NDCrc-198. University of California. September 25, 1943.
- M5** Oxygen converter. Revised Akerman apparatus developed for NDRC. R. K. West. US Navy Department, Bureau of Aeronautics. October 26, 1943.
- M6** Tests of Akerman oxygen vaporizer under simulated flight conditions. S. S. Prentiss and John R. Pappenheimer. May 4, 1944.
- M7** Problems related to the use of liquid oxygen and to design and operating characteristics of liquid oxygen converters. [S. S. Prentiss.] July, 1944.
- M8** Performance characteristics of portable liquid oxygen converters. (Report No. TSEAL-3-660-61-I.) V. J. Wulff. US Army Air Forces, Air Technical Service Command. March 15, 1945.
- M9** Design requirements and test results on aircraft-type liquid oxygen converters. (Report No. TSEAL-3-660-61-J.) V. J. Wulff. US Army Air Forces, Air Technical Service Command. March 25, 1945.
- M10** [The] NDRC-National Bureau of Standards-Ohio Chemical conference on liquid oxygen converters. W. A. Wildhack. National Bureau of Standards. April 9, 1945.
- M11** Akerman-Piccard liquid oxygen converter. John D. Akerman and Jean F. Piccard. OEMsr-364. University of Minnesota. June 12, 1945.
- M12** Liquid oxygen converter. W. W. Hay. OEMsr-934 (Sub-Contract No. 3). Ohio Chemical and Manufacturing Company. September 28, 1945.
- M13** Problem related to the use of liquid oxygen and to design and operating characteristic of liquid oxygen converters. (n.a.) (n.d.)

104 Rectification of Air

- M1** Review of program of experimental work for NDRC. (n.a.) OEMsr-355. Yale University. September 8, 1942.

104.1 Equipment

- M1** Tests on oxygen rectification equipment. ([Report No. 206] to February 12, 1942.) S. S. Prentiss. OSRD No. 450. [February 12, 1942.]
- M2** Oxygen project, NDCrc-182; rectifiers. (Special Report No. 1.) [Frederick G. Keyes(?)] NDCrc-182. [Massachusetts Institute of Technology.] February 27, 1942.

104.11 Plate and Packed Towers

- M1** Letter to Walter E. Lobo. Subject: Rectification problems. J. G. Aston. Pennsylvania State College. January 4, 1942.
- M2** Rectification of air in a two-inch packed column. ([Report No. 365] to August 6, 1942.) Barnett F. Dodge. OEMsr-355; Service Project Nos. AC-12, NL-B42 and NL-B6; OSRD No. 876. Yale University. September 17, 1942.
- M3** Tray calculations made at Pennsylvania State Col-

lege. J. G. Aston and June Pfister. Pennsylvania State College. [February 15, 1943(?)]

- M4** Calculation of the number of plates in an air rectification tower. (Report to January 25, 1944.) J. G. Aston. OEMsr-685; Service Project Nos. AC-12, NA-111 and others; OSRD No. 3524. Pennsylvania State College. April 25, 1944.

104.12 Portable Unit Columns

- M1** Tests of performance of an 8-inch portable unit column for air rectification. (Progress Reports [for the period] July and August, 1942.) J. G. Aston and others. Pennsylvania State College.
- M2** Full-scale studies of the efficiency of packed columns in air rectification (low-pressure system) in collaboration with the M. W. Kellogg Company. (Monthly Report for the period ending June 30, 1942.) J. G. Aston. Pennsylvania State College. July 15, 1942.
- M3** Tests of performance of portable unit columns for air rectification. (Progress Reports for [the period from] August, 1942 to September, 1943.) J. G. Aston, Charles Brouse and others. [Pennsylvania State College.]
- M4** Tests of performance of portable unit columns for air rectification. ([Final Report] to January 6, 1944.) J. G. Aston. OEMsr-685; Service Project Nos. AC-12, NA-111 and others; OSRD No. 3699. Pennsylvania State College. May 29, 1944.

104.13 Heat Exchangers and Regenerators

- M1** Heat interchangers for gases. Alternating flow scrubber-heat exchanger. (Special Report Nos. 2 and 3.) S. C. Collins. NDCrc-182. [Massachusetts Institute of Technology.] March 9, 1942.
- M2** Preliminary results of tests on regenerators. Harding Bliss. OEMsr-355. Yale University. August 1, 1942.
- M3** Low-temperature heat interchangers. W. F. Giauque. NDCrc-198. University of California. April 19, 1943.
- M4** Regenerators. (Progress Report [covering period from] August 1, 1942 to March 15, 1943.) Harding Bliss. OEMsr-355; Service Project Nos. NL-B6 and AC-12; OSRD No. 1443. Yale University. May 21, 1943.
- M5** [The] history of the development of heat exchangers for low-pressure mobile oxygen units. [Walter E. Lobo.] M. W. Kellogg Company. October 4, 1943.
- M6** The history of the development of heat exchangers for low-pressure mobile oxygen units. Walter E. Lobo and George T. Skaperdas. M. W. Kellogg Company. October 9, 1943.
- M7** Heat transfer and pressure drop in Collins exchangers. (Report to August 15, 1944.) P. R. Trumpler. OEMsr-365; Service Project Nos. NA-111, NS-115 and others; OSRD No. 4143. M. W. Kellogg Company. September 19, 1944.
- M8** Some consideration on the removal of water and

carbon dioxide in reversing exchangers. (n.a.) (n.d.)

104.131 Insulators

- M1** [The] insulating power of glass wool. (n.a.) OEMsr-269. Arthur D. Little, Inc. April 8, 1943.
- M2** [The] performance of heat-insulating materials at low temperatures. John B. Dwyer. OEMsr-355. Yale University. November 22, 1943.

104.2 Instruments

- M1** Combined oxygen vapor pressure and gas thermometers for use in the temperature range -320°F to 100°F . Donald S. Parker and Malcolm L. Sagenkahn. Pennsylvania State College. September 24, 1943.
- M2** Measurement of inspiratory and expiratory air velocities at altitude. (Report No. 208.) John R. Pappenheimer and John C. Lilly. University of Pennsylvania. November 30, 1943.
- M3** Combined oxygen vapor pressure and gas thermometer. ([Final Report] to January 6, 1944.) J. G. Aston. OEMsr-685; Service Project Nos. NA-111, NA-115 and NS-116; OSRD No. 3483. Pennsylvania State College. April 14, 1944.
- M4** Analysis by the ammonium hydroxide-ammonium chloride-copper method of high oxygen content gases contaminated with argon or nitrogen. D. C. Reams, Jr. [University of Pennsylvania.] June 1, 1944.
- M5** Methods of production and calibration of combination vapor pressure and gas dial thermometers. Paul Erbguth and J. G. Aston. OEMsr-934. University of Pennsylvania. January 26, 1945.

105 Purification of Air

105.1 Presence of Impurities

- M1** Estimation of oil contamination in air from compressors of portable air rectification units. (Report to January 19, 1944.) J. G. Aston. OEMsr-685; Service Project Nos. AC-12, NA-111 and others; OSRD No. 3484. Pennsylvania State College. April 14, 1944.
- M2** Literature survey on the estimation of small amounts of hydrocarbons in air. The importance of these compounds in the rectification of air. William R. James, Jr. (n.d.)

105.2 Removal

105.21 Moisture

- M1** Drying air with activated granular adsorbents. J. F. Skelly. M. W. Kellogg Company. April 3, 1943.

105.22 Carbon Dioxide

- M1** A colorimetric method for the determination of traces of carbon dioxide in air. ([Progress Report] to February 8, 1943.) Norman A. Spector. OEMsr-

355; Service Project Nos. NL-B6 and AC-12; OSRD No. 1426. Yale University. May 17, 1943.

M2 Absorption of CO₂ from normal air by soda lime. T. L. Wheeler. OEMsr-269 (Supplement No. 3). Arthur D. Little, Inc. December 8, 1943.

M3 Processes for the removal of carbon dioxide from the atmosphere of a submarine. Allan P. Colburn and Barnett F. Dodge. University of Pennsylvania. February 20, 1944.

M4 The removal of carbon dioxide from atmospheric air. (Progress Report to November 1, 1944.) Norman A. Spector. OEMsr-355; Service Project Nos. AC-12, NA-111 and others; OSRD No. 4340. Yale University. November 14, 1944.

105.23 Other Gases

M1 The removal of traces of acetylene and other hydrocarbons from air. J. G. Aston and T. A. Geissman. OEMsr-934. University of Pennsylvania. March 5, 1945.

106 Submarine and Airplane Oxygen

106.1 Submarines

106.11 Exhaust Gases

M1 Experimental study of disposal of exhaust gases from internal combustion engines on naval vessels. (Report to May 1, 1941.) James B. Conant. NDCrc-82. Massachusetts Institute of Technology. June 6, 1941.

M2 Disposal of engine exhaust gases. (Quarterly Report for the period February 1, 1942 to May 1, 1942.) W. H. McAdams. OEMsr-122. Massachusetts Institute of Technology. [May, 1942.]

M3 Disposal of exhaust gases. (Monthly Reports for [the] period August to October, 1942.) W. H. McAdams. OEMsr-122. Massachusetts Institute of Technology.

M4 Dispersion of exhaust gases in sea water. W. H. McAdams. OEMsr-122; Service Project No. NL-B6c; OSRD No. 1238. Massachusetts Institute of Technology. March 4, 1943.

106.111 Dispersers

M1 [Dispersers.] (Monthly Progress Report for period from November 15 to December 15, 1941.) W. H. McAdams. [Massachusetts Institute of Technology.] December 20, 1941.

M2 [Water injection disperser.] (Monthly Progress Report [covering period from January 15 to February 15, 1942.] W. H. McAdams. NDCrc-82. [Massachusetts Institute of Technology.] [February, 1942.]

M3 [Carbon dioxide gas.] (Monthly Progress Report covering period [from] February 15 to March 15, 1942.) W. H. McAdams. OEMsr-122. [Massachusetts Institute of Technology.] March 14, 1942.

M4 [Carbon dioxide gas.] (Monthly Progress Report covering period [from] March 15 to April 15, 1942.)

W. H. McAdams. OEMsr-122. [Massachusetts Institute of Technology.] April 14, 1942.

M5 [Two-stage water injection type gas disperser.] (Monthly Progress Report covering period [from] May 15 to June 15, 1942.) W. H. McAdams. [OEMsr-122.] [Massachusetts Institute of Technology.] June 15, 1942.

M6 [Dispersion-absorption runs.] (Monthly Progress Report covering period [from] June 15 to July 15, 1942.) W. H. McAdams. OEMsr-122. [Massachusetts Institute of Technology.] July 15, 1942.

M7 [Two-stage water injection dispersers.] (Quarterly Report for period ending July 31, 1942.) W. H. McAdams. [OEMsr-122.] [Massachusetts Institute of Technology.] July 29, 1942.

M8 [Two-stage dispersers.] (Monthly Progress Report covering period [from] July 15 to August 15, 1942.) W. H. McAdams. [OEMsr-122.] [Massachusetts Institute of Technology.] August 12, 1942.

106.12 Diesel Engine Operation While Submerged

M1 Letter to Dr. T. K. Sherwood. Subject: Special submarine engine problem. W. J. Sweeney. Standard Oil Development Company. November 27, 1940.

M2 Special Engine Project No. 41. (Fifth Progress Report.) G. H. Cloud, H. L. Leland and W. W. Manville. [NDCrc-90.] Standard Oil Development Company. October 27, 1941.

M3 Special Engine Project No. 41. (Monthly Reports covering period from December 2, 1941 to September 15, 1942.) G. H. Cloud, N. H. Rickles and H. L. Thwaites. NDCrc-90. Standard Oil Development Company.

M4 Appendix to report of Oxygen Conference, Tuesday, January 27, 1942. W. J. Sweeney. Massachusetts Institute of Technology. February 9, 1942.

M5 Operation of Diesel engines on oxygen. (Final Report to October 15, 1942.) N. H. Rickles and H. L. Thwaites. NDCrc-90; Service Project No. NL-B6b; OSRD No. 1425. Standard Oil Development Company. May 17, 1943.

106.2 Airplanes

M1 [The] biological effects of carbon monoxide. W. E. Catterall. Massachusetts Institute of Technology. February 18, 1943.

106.21 Water Vapor Content

M1 A method for measuring water vapor in compressed gases. (n.a.) National Bureau of Standards. July 10, 1942.

M2 A method for measuring water vapor in compressed gases. (n.a.) National Bureau of Standards. [October 9, 1942.]

M3 Letter to S. S. Prentiss. Subject: Determining moisture in oxygen. E. R. Weaver. National Bureau of Standards. March 2, 1943.

M4 A method for measuring water vapor in com-

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pressed gases. (n.a.) National Bureau of Standards. March 20, 1943.

- M5** Operation of the electrical water vapor detector. (n.a.) National Bureau of Standards. [May 1, 1943.]
- M6** Accuracy of the electrical method for determining water in compressed gases. (n.a.) National Bureau of Standards. June 14, 1943.
- M7** Instrument for testing water vapor content and carbon monoxide content in aviator's oxygen. T. L. Wheeler and Gilbert W. King. [Arthur D. Little, Inc.] [January 5, 1944.]
- M8** Further development of the instrument for measuring water vapor content in aviator's oxygen. (Progress Reports covering period from February, 1944 to February, 1945.) T. L. Wheeler, Gilbert W. King and Allen Latham, Jr. OEMsr-269. Arthur D. Little, Inc.
- M9** Instrument for measuring water vapor content in aviator's oxygen. (Report to April 11, 1945.) T. L. Wheeler and Howard O. McMahon. OEMsr-269; Service Project No. NA-138; OSRD No. 5151. Arthur D. Little, Inc. May 31, 1945.
- M10** Instruction for operation of the moisture indicator. (n.a.) OEMsr-269. Arthur D. Little, Inc. July 11, 1945.

106.3 Oxygen Meters

- M1** [Oxygen meters.] (Progress Reports covering period from March, 1942 to June 15, 1944.) Linus Pauling. OEMsr-326, OEMsr-584 and NDCrc-200. California Institute of Technology.
- M2** Improvements in instrument for measuring the partial pressure of oxygen. (Report No. 314, to July 10, 1942.) Linus Pauling, Reuben E. Wood and J. H. Sturdivant. NDCrc-200; Service Project No. NL-B1(f); OSRD No. 779. California Institute of Technology. August 8, 1942.
- M3** Oxygen meter. ([Monthly] Report Nos. 1 and 2.) Arnold O. Beckman. OEMsr-624. November 15 and December 15, 1942.
- M4** Oxygen meter. (Monthly Report Nos. 1 and 2.) Arnold O. Beckman. OEMsr-625. November 15 and December 15, 1942.
- M5** A survey of the Pauling oxygen meter project. Reuben E. Wood. OEMsr-584. [California Institute of Technology.] June 14, 1943.
- M6** Performance of Model P Pauling oxygen meters in a flying airplane. Reuben E. Wood. [California Institute of Technology.] [September 1, 1943.]
- M7** [The] Pauling oxygen meter. [Arnold O. Beckman(?)] February 22, 1944.
- M8** The Pauling oxygen meter. (Report to June 30, 1944.) Reuben E. Wood and David P. Shoemaker. OEMsr-584; Service Project No. NL-B1(f); OSRD No. 4361. California Institute of Technology. November 20, 1944.
- M9** Development and manufacture of Pauling oxygen meters. Arnold O. Beckman. OEMsr-625; Service

Project No. NL-B1(f); OSRD No. 6662. June 30, 1945.

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CHEMICAL ENGINEERING

200.1

Hydraulic Fluids

- M1** Hydraulic fluids. (Report No. 1.) M. R. Fenske. Pennsylvania State College. May 7, 1941.
- M2** Hydraulic and recoil oils. (Report No. 284.) M. R. Fenske. OEMsr-408; Service Project Nos. AC-7, AC-8 and OD-61; OSRD No. 695. Pennsylvania State College. June 30, 1942.
- M3** Hydraulic and recoil oils. (Sixth Progress Report.) M. R. Fenske. OEMsr-408; Service Project Nos. AC-7, AC-8 and OD-61; OSRD No. 1029. Pennsylvania State College. November 25, 1942.
- M4** Hydraulic and recoil oils. (Seventh Progress Report, to April 8, 1943.) M. R. Fenske. OEMsr-408; Service Project Nos. AC-7, AC-8 and OD-61; OSRD No. 1369. Pennsylvania State College. April 27, 1943.
- M5** Hydraulic and recoil oils. (Eighth Progress Report [from] April 9, 1943 to September 24, 1943.) M. R. Fenske. OEMsr-408; Service Project Nos. AC-7, AC-8 and OD-61; OSRD No. 1894. Pennsylvania State College. October 6, 1943.
- M6** Hydraulic and recoil oils. (Ninth Progress Report covering period from September 24, 1943 to April 11, 1944.) M. R. Fenske. OEMsr-408; Service Project Nos. AC-7, AC-8 and OD-61; OSRD No. 3499. Pennsylvania State College. April 17, 1944.
- M7** Hydraulic, recoil and special oils. (Tenth Progress Report.) M. R. Fenske. [OEMsr-408; Service Project Nos. AC-7, AC-8 and OD-61;] OSRD No. 4492. Pennsylvania State College. December 12, 1944.
- M8** Hydraulic, recoil and special oils. M. R. Fenske. OEMsr-408; Service Project Nos. AC-7, AC-8 and others; OSRD No. 6643. Pennsylvania State College. March 25, 1946.

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Protection of Aircraft and Aircraft Engines

201.1

Fire Hazards

- M1** Protection of aeroplanes from gasoline fires and explosions. (Report to October 14, 1942.) William R. Yant. OEMsr-425; Service Project No. NA-105; OSRD No. 1019. Mine Safety Appliances Company. October 15, 1942.
- M2** Elimination of fire hazards in aircraft through the use of inert gases. H. W. Naulty. Service Project No. NA-105; OSRD No. 1957. Curtiss-Wright Corporation. October 27, 1943.
- M3** The physiological effects of the inhalation of dichlorodifluoromethane, Freon 12, upon human beings. Protection of airplanes from gasoline fires and explosions. Robert A. Kehoe. OEMsr-425; Service Project No. NA-105; OSRD No. 3072. University of Cincinnati. January 4, 1944.
- M4** The use of exhaust gases to inert the vapor space in aircraft fuel tanks. C. C. Furnas. OEMsr-1244; Service Project No. NA-105; OSRD No. 3828. Curtiss-Wright Corporation. June 26, 1944.

- 201.2 Dust Removal**
M1 Removal of dust from air supplied to aircraft engines. (Report to January 31, 1943.) T. H. Chilton and C. E. Lapple. OEMsr-506; Service Project No. NACA-1; OSRD No. 1178. E. I. duPont de Nemours and Company, Inc. February 4, 1943.
- 202 Pyrotechnics**
- 202.1 Flares**
- 202.11 Underwater**
M1 The development of flares suitable for underwater use. (Report No. 196.) C. R. Hoover. OEMsr-158; OSRD No. 435. Wesleyan University. February 20, 1942.
M2 Underwater flares. G. Albert Hill and R. G. Clarke. OEMsr-321; OSRD No. 1522. Wesleyan University. June 17, 1943.
M3 Underwater flares. G. Albert Hill and R. G. Clarke. OEMsr-321; OSRD No. 4030. Wesleyan University. August 15, 1944.
- 202.12 Colored**
M1 [Colored flares.] G. Albert Hill and R. G. Clarke. OEMsr-321; OSRD No. 4408. Wesleyan University. November 25, 1944.
M2 Colored flares. (Supplement to OSRD No. 4408.) G. Albert Hill and R. G. Clarke. OEMsr-321; OSRD No. 4408A. Wesleyan University. February 10, 1945.
- 202.2 Photoflash Bombs**
M1 Improvement of photoflash bombs. G. Albert Hill and R. G. Clarke. OEMsr-321; Service Project No. AC-29; OSRD No. 2010. Wesleyan University. November 13, 1943.
M2 Results of tests on modified M-46 and M-60 photoflash bombs. G. Albert Hill and R. G. Clarke. OEMsr-321; Service Project No. AC-29; OSRD No. 2095. Wesleyan University. December 6, 1943.
M3 Tests of photoflash bombs. G. Albert Hill and R. G. Clarke. OEMsr-321; Service Project No. AC-29; OSRD No. 5457. Wesleyan University. August 18, 1945.
M4 Apparatus and methods for the study of photoflash bomb explosions. G. Albert Hill, R. G. Clarke and others. OEMsr-321; Service Project No. AC-29; OSRD No. 6333. Wesleyan University. November 15, 1945.
- 202.3 Aerial Photographic Flash Powders**
M1 Aerial photographic flash powders. (Report to October 15, 1941.) C. R. Hoover. NDCrc-92; Service Project No. AC-29; OSRD No. 171. Wesleyan University. November 8, 1941.
M2 Aerial photographic flash powders. Composition and use. (Report No. 223.) C. R. Hoover. NDCrc-
- 92; OSRD No. 497. Wesleyan University. February 15, 1942.
- 203 Use of Chemicals for War**
- 203.1 Inflation of Life Rafts at Low Temperatures**
M1 Means of improving inflation of life rafts at low temperatures. W. H. McAdams, G. C. Williams and C. C. Neas. OEMsr-1169; Service Project No. NE-102; OSRD No. 3101. Massachusetts Institute of Technology. January 11, 1944.
M2 Means of improving inflation of life rafts at low temperatures. W. H. McAdams, C. C. Neas and G. C. Williams. OEMsr-1169; Service Project No. NE-102; OSRD No. 3525. Massachusetts Institute of Technology. April 25, 1944.
- 203.2 Position Identification**
- 203.21 Advanced Position**
M1 Advanced positions identification. J. Bertram Bates. OEMsr-1373; Service Project No. SOS-12; OSRD No. 4691. General Printing Corporation. February 14, 1945.
- 203.22 Sea Markings**
M1 Sea marking devices. James A. MacLeod. OEMsr-1206; Service Project No. NE-100; OSRD No. 4571. General Printing Ink Company. January 9, 1945.
- 203.3 Hydrogen Generation**
M1 Generation of hydrogen for barrage balloons. (Report No. 228.) R. C. Wilcox. Service Project No. AC-39; OSRD No. 531. April 24, 1942.
M2 Design of plant for producing sodium hydride-aluminum mixture. H. G. Hyland and C. M. Hunter. OEMsr-928; Service Project No. SC-44; OSRD No. 3053. E. I. duPont de Nemours and Company, Inc. December 29, 1943.
M3 Generator for the use of sodium hydride-aluminum mixture for field generation of hydrogen. H. A. Bond and J. J. McGovern. OEMsr-928; Service Project No. SC-44; OSRD No. 3141. E. I. duPont de Nemours and Company, Inc. January 15, 1944.
M4 Sodium hydride-aluminum mixtures for field generation of hydrogen. H. A. Bond and J. W. Dunning. OEMsr-928; Service Project No. SC-44; OSRD No. 3142. E. I. duPont de Nemours and Company, Inc. January 15, 1944.
- 203.31 Lithium Compounds**
M1 New processes for lithium production. (Progress Report [for the period] March 15 to October 18, 1943.) (n.a.) OEMsr-930; Service Project No. SC-44; OSRD No. 2089. National Research Corporation. December 3, 1943.
M2 New processes for lithium production. (Progress Report [for the period] March 15 to December 31, 1943.) (n.a.) OEMsr-930; Service Project No. SC-

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44; OSRD No. 3758. National Research Corporation. June 8, 1944.

203.4 Oxygen Masks

- M1** Mine Safety Appliance Company's self-contained oxygen apparatus. (Report No. 35.) Robert J. Benford, Thorne M. Carpenter and others. NDCrc-69. Harvard University. June 2, 1941.
- M2** An account of the construction and efficiency of mask L-12 for oxygen inhalation in military aviation. (Report No. 68.) C. K. Drinker. NDCrc-69; Service Project No. HM-1; OSRD No. 130. Harvard University. August 28, 1941.
- M3** Development of a full-face oxygen mask incorporating ventilated fog-proof lenses. Frank W. Maurer. OEMsr-320; Service Project No. AC-38; OSRD No. 3164. Harvard University. January 20, 1944.
- M4** Full-face oxygen mask incorporating ventilated fog-proof lenses. Frank W. Maurer. OEMsr-320; Service Project No. AC-38; OSRD No. 4584. Harvard University. January 18, 1945.

203.5 War Gases

203.51 Levinstein Mustard

- M1** Storage stability of mustard gas. W. H. Wood. OEMsr-743; Service Project No. CWS-12; OSRD No. 5450. E. I. duPont de Nemours and Company, Inc. August 17, 1945.

203.511 Purification

- M1** Joint Chemical Warfare Service-NDRC report on steam distillation process. H. C. Weber and W. H. McAdams. Chemical Warfare Service Development Laboratory. September 16, 1943.
- M2** Composition of Levinstein mustard. Charles L. Thomas. OEMsr-884; Service Project No. CWS-4; OSRD No. 1978. Universal Oil Products Company. October 29, 1943.
- M3** Purification of Levinstein mustard by crystal fractionation. Louis S. Kassel and Curtis F. Gerald. OEMsr-844; Service Project No. CWS-4; OSRD No. 2003. Universal Oil Products Company. November 9, 1943.
- M4** Purification of Levinstein mustard by distillation with pentane vapor. Louis S. Kassel, Curtis F. Gerald and Charles L. Thomas. OEMsr-844; Service Project No. CWS-4; OSRD No. 3047. Universal Oil Products Company. December 29, 1943.
- M5** Purification of Levinstein mustard. W. E. Kuhn, G. B. Arnold and L. E. Rudisch. OEMsr-897; Service Project No. CWS-4; OSRD No. 3217. The Texas Company. February 5, 1944.
- M6** Purification of crude Levinstein H. W. H. McAdams. OEMsr-1017; Service Project No. CWS-4; OSRD No. 3242. Massachusetts Institute of Technology. February 11, 1944.

203.512 Vesicant Thickeners

- M1** Thickening of vesicants. (Report No. 155.) Duncan A. MacInnes. OEMsr-130; Service Project No. CWS-12; OSRD No. 318. Rockefeller Institute for Medical Research. January 7, 1942.
- M2** Thickening of HS. (Report No. 249.) Donald Belcher and Duncan A. MacInnes. OEMsr-130; Service Project No. CWS-12; OSRD No. 581. Rockefeller Institute for Medical Research. May 15, 1942.
- M3** The thickening of HS-M1 mixtures, and a photographic study of the impact of HS drops on cloth. (Report No. 279.) Duncan A. MacInnes, Donald Belcher and Andrew Tait. OEMsr-130; Service Project Nos. CWS-12 and NL-B36; OSRD No. 667. Rockefeller Institute for Medical Research. June 15, 1942.
- M4** Rheological properties of thickened liquids. (First Report [covering period from] June 5, 1942 to December 1, 1942.) E. K. Carver and G. Broughton. OEMsr-538; Service Project Nos. CWS-10, CWS-12 and others; OSRD No. 1113. Eastman Kodak Company. December 7, 1942.
- M5** Development of vesicant thickeners. (Progress Report [covering period from] December 9, 1942 to January 2, 1943.) M. M. Brubaker. OEMsr-743; Service Project Nos. CWS-10, CWS-12 and CWS-21; OSRD No. 1185. E. I. duPont de Nemours and Company, Inc. February 6, 1943.
- M6** Stability of liquid vesicants. Duncan A. MacInnes and Donald Belcher. OEMsr-130-D; Service Project No. CWS-12; OSRD No. 1346. Rockefeller Institute for Medical Research. April 7, 1943.
- M7** Fragmentation of liquids. (Progress Report to May 1, 1943.) T. H. Chilton, R. L. Pigford and J. B. Tepe. OEMsr-606; Service Project Nos. CWS-10, CWS-12 and CWS-21; OSRD No. 1503. E. I. duPont de Nemours and Company, Inc. May 31, 1943.
- M8** Rheological measurements on thickened vesicants. (Progress Report to August 27, 1943.) E. K. Carver and John R. Van Wazer, Jr. OEMsr-538; Service Project No. CWS-12; OSRD No. 1893. Eastman Kodak Company. October 5, 1943.
- M9** Development of vesicant thickeners. E. P. Czerwin, J. Harmon and W. H. Wood. OEMsr-743; Service Project No. CWS-12; OSRD No. 3450. E. I. duPont de Nemours and Company, Inc. April 6, 1944.
- M10** The use of thickened vesicants in chemical shells. R. L. Pigford and T. H. Chilton. OEMsr-606; Service Project No. CWS-12; OSRD No. 3543. E. I. duPont de Nemours and Company, Inc. April 28, 1944.
- M11** Properties of thickened liquids. R. L. Pigford. OEMsr-606; Service Project Nos. CWS-10, CWS-12 and others; OSRD No. 4284. E. I. duPont de Nemours and Company, Inc. October 25, 1944.
- M12** Polymethyl methacrylate as a thickener for H. J. C. Thomas and W. H. Wood. OEMsr-743; Service Project No. CWS-12; OSRD No. 5347. E. I.

duPont de Nemours and Company, Inc. July 18, 1945.

M13 Vesicant studies. Duncan A. MacInnes and Donald Belcher. OEMsr-130; Service Project Nos. CWS-12, CWS-4 and NL-B36; OSRD No. 5391. Rockefeller Institute for Medical Research. August 10, 1945.

M14 Stability of thickened Levinstein H solutions. E. P. Czerwin and W. H. Wood. OEMsr-743; Service Project No. CWS-12; OSRD No. 5426. E. I. duPont de Nemours and Company, Inc. August 17, 1945.

M15 Neutralization of the effects of iron compounds in thickened Levinstein H. J. Harmon and W. H. Wood. OEMsr-743; Service Project No. CWS-12; OSRD No. 5465. E. I. duPont de Nemours and Company, Inc. August 22, 1945.

M16 Improvement of vesicants. Studies of HP. E. K. Ellingboe and C. W. Todd. OEMsr-743; Service Project No. CWS-4; OSRD No. 6622. E. I. duPont de Nemours and Company, Inc. February 25, 1946.

M17 Vesicant studies. Vesicant thickeners. Mustard compositions having accelerated evaporation rates. J. E. Kirby. OEMsr-743; Service Project Nos. CWS-12 and CWS-4; OSRD No. 6623. E. I. duPont de Nemours and Company, Inc. February 25, 1946.

203.52 Gas Dispersal

203.521 Bombs

M1 [The] M-67 modified for improved dispersion of H. J. R. Peer, G. Broughton and C. K. Carver. OEMsr-538; Service Project No. CWS-27; OSRD No. 2058. Eastman Kodak Company. November 20, 1943.

203.522 Airplane

M1 Airplane vesicant spray. T. K. Sherwood. OSRD No. 2093. December 2, 1943.

203.523 Vaporization

M1 Vaporization characteristics of H and HP. A. W. Larchar. OEMsr-743; Service Project No. CWS-4; OSRD No. 4634. E. I. duPont de Nemours and Company, Inc. January 27, 1945.

M2 Vaporization characteristics of H and HP. A. J. Hill, Jr. OEMsr-743; Service Project No. CWS-4; OSRD No. 5164. E. I. duPont de Nemours and Company, Inc. May 31, 1945.

203.524 Drop Dispersion

M1 Evaporation of falling drops. (Progress Report to October 17, 1941.) T. K. Sherwood and G. C. Williams. OEMsr-6; Service Project No. CWS-12. Massachusetts Institute of Technology. December 6, 1941.

M2 Drop dispersion measurements by use of a laboratory mortar. R. L. Pigford and T. H. Chilton. OEMsr-606; Service Project No. CWS-12; OSRD

No. 3542. E. I. duPont de Nemours and Company, Inc. April 28, 1944.

203.6 Liquid-Filled Shells

M1 The use of thickened vesicants in chemical shells. A literature survey. R. L. Pigford and T. H. Chilton. OEMsr-606; Project No. TX-W-2. E. I. duPont de Nemours and Company, Inc. January 12, 1944.

M2 Exterior ballistics of liquid-filled shell. R. L. Pigford. OEMsr-1395; Service Project No. CWS-31; OSRD No. 6441. E. I. duPont de Nemours and Company, Inc. December 29, 1945.

203.7 Potable Water

203.71 From Sea Water

M1 Removal of salts from sea water. (Report to June 15, 1941.) Arthur M. Buswell. NDCrc-50; Service Project, No. NL-B5. University of Illinois. June 15, 1941.

M2 Hand-operated vapor compression still for producing potable water from sea water. T. L. Wheeler and Allen Latham, Jr. OEMsr-1047; Service Project No. NS-168; OSRD No. 3197. Arthur D. Little, Inc. January 29, 1944.

M3 Solar distiller for life rafts. Maria Telkes. OEMsr-1164; Service Project No. NS-168; OSRD No. 5225. Massachusetts Institute of Technology. June 19, 1945.

203.72 Purification After Transportation

M1 Methods for the purification of water after its transportation and storage in cans, drums and tanks that have been employed as containers for leaded gasoline. (Report No. 472.) Robert A. Kehoe and J. Cholak. OEMsr-341; Service Project No. CE-19; OSRD No. 1139. University of Cincinnati. December 9, 1942.

203.8 Bleaches

203.81 Storage of Chlorinated Lime

M1 Storage of chlorinated lime. Dayton E. Garritt. CQP Miscellaneous Project No. 1. Rhode Island State College. (n.d.)

M2 Storage of chlorinated lime. Jacob Katz and W. George Parks. CQP Miscellaneous Project No. 3. Rhode Island State College. (n.d.)

204 Instantaneous Respiration Rates

204.1 Penetration Measurements

M1 Instantaneous penetration measurements under conditions approximating human respiration. (Report [to] October 1, 1943.) W. K. Lewis and F. A. Wolff. OEMsr-347; Service Project Nos. CWS-1 and CWS-16; OSRD No. 1866. Massachusetts Institute of Technology. October 1, 1943.

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204.2 Protective Respiratory Equipment

- M1** Fundamental factors in the design of protective respiratory equipment. Leslie Silverman, Robert C. Lee and others. OEMsr-306; Service Project Nos. CWS-7 and CWS-16; OSRD No. 1222. Harvard University. March 4, 1943.
- M2** Fundamental factors in the design of respiratory equipment. The characteristics of inspiratory and expiratory valves. (Progress Report to August 1, 1943.) Leslie Silverman, Robert C. Lee and George Lee. OEMsr-306; Service Project Nos. CWS-16 and CWS-1; OSRD No. 1864. Harvard University. October 1, 1943.
- M3** Fundamental factors in the design of protective respiratory equipment. Inspiratory resistances of US Army Chemical Warfare Service gas masks with static and dynamic air flow. Leslie Silverman and Robert C. Lee. OEMsr-306; Service Project No. CWS-7; OSRD No. 3526. Harvard University. April 25, 1944.
- M4** Fundamental factors in the design of protective respiratory equipment. End point breathing rate studies. (n.a.) OEMsr-306; OSRD No. 4229. Harvard University. October 9, 1944.
- M5** Fundamental factors in the design of protective respiratory equipment. A portable instrument for measuring respiratory air flows under field conditions. Leslie Silverman, Theodore Plotkin and others. OEMsr-306; OSRD No. 5338. Harvard University, Carnegie Institution of Washington and Massachusetts Institute of Technology. July 17, 1945.
- M6** Fundamental factors in the design of protective respiratory equipment. A study and an evaluation of inspiratory and expiratory resistances for protective respiratory equipment. Leslie Silverman, George Lee and others. OEMsr-306; Service Project No. CWS-7; OSRD No. 5339. Harvard University. July 17, 1945.
- M7** Fundamental factors in the design of protective respiratory equipment. Measurements of inspiratory air flow on soldiers performing various field operations. Leslie Silverman, Theodore Plotkin and George Lee. OEMsr-306; Service Project No. CWS-7; OSRD No. 5496. Harvard University. August 27, 1945.
- M8** Fundamental factors in the design of protective respiratory equipment. Inspiratory and expiratory air flow measurements on human subjects with and without resistance at several work rates. Leslie Silverman, George Lee and others. OEMsr-306; Service Project No. CWS-7; OSRD No. 5732. Harvard University. September 18, 1945.

205 Sabotage of Fuels and Engines**205.1 Fuels**

- M1** Chemical treatment of oils. Sabotage of gasoline. (Progress Report for period from October 1, 1940 to March 7, 1941.) (n.a.) Service Project Nos.

AC-2 and CWS-5; OSRD No. 81. Monsanto Chemical Company. March 7, 1941.

- M2** Preliminary study of methods of sabotage of lubricating oils. H. B. Weiser. OEMsr-189; Service Project No. AC-2; OSRD No. 471. Rice Institute. March 28, 1942.
- M3** Sabotaging engines by additions to the lubricating oil. (Final Report to January 15, 1943.) T. A. Boyd. OEMsr-428; Service Project No. AC-2; OSRD No. 1252. Ethyl Gasoline Corporation. March 11, 1943.

205.2 Gasoline Engines (Pro-Knock)

- M1** Pro-knock. (Final Report to August 4, 1941.) Thomas Midgley, Jr. and Albert L. Henne. NDCrc-3; Service Project Nos. AC-2 and CWS-5. Ethyl Gasoline Corporation. September 5, 1941.
- M2** Effect of strong pro-knock materials in gasoline similar to that reportedly used in German aircraft. Thomas Midgley, Jr. Service Project Nos. AC-2 and CWS-5; OSRD No. 183. Ethyl Gasoline Corporation. December 1, 1941.
- M3** Pro-knock materials. Thomas Midgley, Jr. Service Project Nos. AC-2 and CWS-5; OSRD No. 392. Ethyl Gasoline Corporation. February 12, 1942.
- M4** Pro-knock. (Supplement to the Final Report of May 26, 1942.) (n.a.) OEMsr-231; Service Project No. AC-2; OSRD No. 1281. Ethyl Gasoline Corporation. March 20, 1943.

206 Protective Coatings

- M1** Protective coatings for ship bottoms and naval aircraft. (Report to January 15, 1942.) A. J. Weith and V. H. Turkington. OEMsr-211; Service Project No. NL-B4; OSRD No. 413. Bakelite Corporation. February 26, 1942.
- M2** Protective coatings. A. J. Weith and V. H. Turkington. OEMsr-211; Service Project Nos. NL-B2 and NL-B4; OSRD No. 651. Bakelite Corporation. April 30, 1942.
- M3** The value of electrical resistance in studying the protective behavior of organic coatings on mild steel immersed in sea water. (n.a.) OEMsr-211; Service Project No. NL-B4; OSRD No. 4847. Bakelite Corporation. March 23, 1945.
- M4** Interaction of antifouling paints and steel. Alfred C. Redfield. OSRD No. 5053. Woods Hole Oceanographic Institution. May 11, 1945.

206.1 Ship Bottoms**206.11 Coatings**

- M1** Protective coatings for ship bottoms. (Problem No. 27.) (n.a.) NDCrc-42. Bakelite Corporation. March 31, 1941.
- M2** Protective coatings for ship bottoms. (Report No. 159.) A. J. Weith and V. H. Turkington. OEMsr-52; Service Project No. NL-B4; OSRD No. 324. Bakelite Corporation. January 14, 1942.
- M3** Naval aircraft coatings. (Progress Report [covering]

ninety-day period ending April 30, 1942.) A. J. Weith and V. H. Turkington. OEMsr-211. Bakelite Corporation. June 5, 1942.

- M4** Protective coatings for ship bottoms. (Report No. 366.) A. J. Weith and V. H. Turkington. OEMsr-211; Service Project No. NL-B4; OSRD No. 881. Bakelite Corporation. August 25, 1942.
- M5** Annotated bibliography and subject index on ship bottom fouling organisms and antifouling research. Part I, Annotated bibliography. Part II, Subject index. Part III, Summaries. George L. Clark. OEMsr-204; Service Project No. NL-B4; OSRD No. 1006. Harvard University. September 15, 1942.
- M6** Protective coatings for ship bottoms. (Progress Report to December 1, 1942.) A. J. Weith and V. H. Turkington. OEMsr-211; Service Project No. NL-B4; OSRD No. 1174. Bakelite Corporation. February 3, 1943.
- M7** Protective coatings for ship bottoms. (n.a.) OEMsr-211; OSRD No. 1838. Bakelite Corporation. September 9, 1943.
- M8** Protective coatings for magnesium alloys. (Preliminary Report [covering] period ending October 31, 1943.) (n.a.) OEMsr-211; OSRD No. [2094]. Bakelite Corporation. November 30, 1943.
- M9** Effects of atmospheric exposure on paints previously submerged in the sea. (n.a.) OEMsr-211; Service Project No. NL-B4; OSRD No. 3904. Bakelite Corporation. July 17, 1944.
- M10** Coatings for wood ship bottoms. (n.a.) OEMsr-211; Service Project No. NL-B4; OSRD No. 4044. Bakelite Corporation. August 21, 1944.
- M11** Studies of anticorrosive and antifouling coating systems for ship bottoms. (n.a.) OEMsr-211; Service Project No. NL-B4; OSRD No. 6649. Bakelite Corporation. April 5, 1946.

206.12 Cleaning

- M1** Methods for cleaning ship bottoms. (n.a.) OEMsr-446; Service Project No. NL-B4; OSRD No. 1310. Bakelite Corporation. April 2, 1943.

206.2 Aircraft

- M1** Protective coatings for naval aircraft. (n.a.) NDCrc-42. Bakelite Corporation. March 31, 1941.
- M2** Protective coatings for naval aircraft. A. J. Weith and V. H. Turkington. OEMsr-211; Service Project No. NL-B4; OSRD No. 368. Bakelite Corporation. February 7, 1942.

206.3 Paint Removers

- M1** Paint removers. (Report No. 11.) J. C. Elgin. [Princeton University.] February 20, 1941.
- M2** Commercial paint removers. (Report No. 20.) [J. C. Elgin(?)] NDCrc-29. Princeton University. April 2, 1941.
- M3** Investigation of paint removers. (Report to October 31, 1941.) J. C. Elgin. NDCrc-29; Service Project No. NL-B2; OSRD No. 279. Princeton University. December 9, 1941.

206.4 Coating Corrosion

- M1** Methods of studying corrosion and blistering tendencies of underwater coatings. (n.a.) OEMsr-211; Service Project No. NL-B4; OSRD No. 3066. Bakelite Corporation. January 3, 1944.
- M2** Paint destruction and metal corrosion. Selman A. Waksman and Robert L. Starkey. OEMsr-1259; Service Project No. NS-235; OSRD No. 4402. Rutgers University. November 30, 1944.

206.41 Biological Effects

- M1** Paint destruction and metal corrosion. Zoological aspects. Thurlow C. Nelson and E. R. Kodet. OEMsr-1259; Service Project No. NS-235; OSRD No. 4512. Rutgers University. December 27, 1944.
- M2** Microbiological and zoological aspects of paint destruction and metal corrosion. Robert L. Starkey and John D. Schenone. OEMsr-1259; Service Project No. NS-235; OSRD No. 5665. Rutgers University. September 12, 1945.

206.5 Magnesium Alloy Coatings

- M1** Protective coatings for magnesium and its alloys. (Progress Report to April 30, 1943.) (n.a.) OEMsr-211; Service Project No. NA-122; OSRD No. 1462. Bakelite Corporation. May 28, 1943.
- M2** Protective coatings for magnesium alloys. (n.a.) OEMsr-211; Service Project No. NA-122; OSRD No. 2094. Bakelite Corporation. December 6, 1943.

206.51 Magnesium Fluoride for Lens Coatings

- M1** Investigation of methods of producing magnesium fluoride for the filming of lenses. Frank C. Mathers. OEMsr-1194; Service Project No. NO-189; OSRD No. 5449. University of Indiana. August 17, 1945.

206.6 Fire Protection Coatings

- M1** Fire retardant paints for Navy ships. (n.a.) OEMsr-211; Service Project No. NS-129; OSRD No. 1407. Bakelite Corporation. May 11, 1943.

206.7 Munition Protection

- M1** Corrosion resistant coatings for chemical munitions. Neil Thurman and Paul Robinson. OEMsr-796; Service Project Nos. CWS-13 and NO-126; OSRD No. 1520. E. I. duPont de Nemours and Company, Inc. June 17, 1943.
- M2** Sealing of Navy primers and fuzes. W. F. Singleton and W. C. Johnson. OEMsr-796; Service Project No. NO-288; OSRD No. 6440. E. I. duPont de Nemours and Company, Inc. December 29, 1945.

206.8 Food, Fuel and Lubricant Containers

- M1** Coatings, organic. (Final Report for the period October 15, 1943 to July 31, 1944.) W. T. Pearce. OEMsr-1055; Service Project No. QMC-31. Temple University. July, 1944.

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- M2** Linings for fuel and lubricant containers. O. W. Tissari. OEMsr-796 and NDCrc-711; Service Project Nos. QMC-28 and AN-13; OSRD No. 4762. E. I. duPont de Nemours and Company, Inc. March 3, 1945.
- M3** The Cox marine electrocoating process. O. W. Tissari. OEMsr-1223; Service Project No. QMC-28; OSRD No. 4862. Comstock and Wescott, Inc. March 27, 1945.
- M4** Packaging with plastics. (Final Report for the period May 1 to October 31, 1945.) Harry F. Lewis, T. A. Howells and Otto Kress. W44-109 qm-305; Service Project No. QMC-44. Institute of Paper Chemistry. November, 1945.
- 206.9 Leather Dressings**
- M1** The preservation of shoe sewing thread. Robert M. Lollar. OEMsr-718; Service Project No. QMC-17; OSRD No. 3069. University of Cincinnati. January 3, 1944.
- M2** The influence of oils on shoe leathers. Behavior of oil-treated leather at cold and hot temperatures. William T. Roddy and Domingo B. Gapuz. OEMsr-718; Service Project No. QMC-17; OSRD No. 3117. University of Cincinnati. January 13, 1944.
- M3** Sterilization of used army shoes. Hoke S. Greene. OEMsr-718; Service Project No. QMC-17; OSRD No. 3118. University of Cincinnati. January 13, 1944.
- M4** Mold resistant treatments for leathers. Robert M. Lollar. OEMsr-718; Service Project No. QMC-17; OSRD No. 3119. University of Cincinnati. January 13, 1944.
- M5** Preservatives in army dubbings. Hoke S. Greene and Robert M. Lollar. OEMsr-718; Service Project No. QMC-17; OSRD No. 3120. University of Cincinnati. January 13, 1944.
- M6** Leather, Improvement of (Final Report for the period September 10, 1943 to September 1, 1945.) Fred O'Flaherty. W44-109 qm-305; Service Project No. QMC-17. University of Cincinnati. September, 1945.
- 207 Removal of Impurities**
- 207.1 Oil from Water**
- M1** Confining and collecting petroleum products from spills or leaks to waterways. W. B. Hart. Service Project No. NS-103; OSRD No. 916. Atlantic Refining Company. September 15, 1942.
- M2** The removal of oil from harbor waters by means of chemically treated sand. (Final Report to November 30, 1942.) Morrough P. O'Brien. OEMsr-672; Service Project No. NS-103; OSRD No. 1120. University of California. January 12, 1943.
- 207.2 Dust from Gun Emplacements**
- M1** Suppression of dust around artillery emplacements. Chemical treatment of ground. L. B. Ryon. OEMsr-1271; Service Project No. OD-154; OSRD No. 4540. Rice Institute. January 4, 1945.
- M2** Suppression of dust around artillery emplacements. Blast mats. L. B. Ryon. OEMsr-1271; Service Project No. OD-154; OSRD No. 5308. Rice Institute. July 2, 1945.
- 208 Quartermaster Corps Research**
- 208.1 Textiles**
- 208.11 Wear Resistance**
- M1** Wear resistance of apparel textiles. (Final Report [for the period] February 1, 1944 to May 1, 1945.) E. R. Schwarz, W. J. Hamburger and others. OEMsr-1055; Service Project No. QMC-33. Massachusetts Institute of Technology and Fabric Research Laboratories, Inc. [May, 1945.]
- 208.12 Water Repellency**
- M1** Evaluation procedures for water repellency treatments. (Volume 1. Final Report [for the period] January 1, 1943 to December 31, 1944.) Arnold M. Sookne, Francis W. Minor and others. OEMsr-1055; Service Project No. QMC-20. [National Bureau of Standards.] [January, 1945.]
- M2** Coated fabrics and thin films. (Report for the period October, 1943 to January, 1946.) Paul M. Doty, Turner Alfrey and others. W44-109 qm-305; Service Project No. QMC-36. Brooklyn Polytechnic Institute. February 1, 1946.
- 208.13 Shrink-proofing**
- M1** Shrink-proofing of wool knitted items and fabrics. (Volume 1. Final Report [for the period] March 1, 1944 through December 31, 1944.) Arthur L. Smith, Lydia R. Hornstein and others. OEMsr-1055; Service Project No. QMC-34. National Bureau of Standards. [January, 1945.]
- 208.14 Storage of Impregnated Fabrics**
- M1** Prevention of degradation of impregnated clothing. (Final Report [for the period] July 1, 1943 through December 31, 1944.) Henry A. Rutherford, Julian Berch and others. OEMsr-1055; Service Project No. QMC-29. National Bureau of Standards. [January, 1945.]
- 208.2 Plastic Laminates Used as Armor (Doron)**
- 208.21 Materials and Preparation of Laminates**
- M1** [Plastic laminated structures used as armor.] (Final Report [for the period] December 1, 1943 to May 31, 1944.) L. S. Meyer and J. C. Case. OEMsr-1055; Service Project No. QMC-30-I. Libbey-Owens-Ford Glass Company. [June, 1944.]
- M2** Evaluation of plastic materials and development of production testing. (Final Report [for the period] January 1, 1944 to June 30, 1944.) R. W. Auxier and K. L. Landon. OEMsr-1055; Service

Project No. QMC-30-C. Westinghouse Electric and Manufacturing Company, Inc. [July, 1944.]

- M3** [Plastic laminates used as armor.] (Volume I. Final Report [for the period] December 1, 1943 to November 1, 1944.) H. W. Mohrman and D. Tel-fair. OEMsr-1055; Service Project No. QMC-30-F. Monsanto Chemical Company. [November, 1944.]
- M4** Doron. [Plastic laminates used as armor.] (Final Report [for the period] December 11, 1943 to October 31, 1944.) Nelson J. Anderson and J. G. Wisler. OEMsr-1055; Service Project No. QMC-30-G. American Cyanamid Company. [November, 1944.]
- M5** Doron. [Plastic laminates used as armor.] (Volume II. Final Report [for the period] October 31, 1944 to June 30, 1945.) Nelson J. Anderson and J. G. Wisler. W44-109 qm-305; Service Project No. QMC-30-G. American Cyanamid Company. [June, 1945.]

208.22 Ballistic Testing and Evaluation

- M1** Investigation of ballistic properties of doron. (Final Report [for the period] November 1, 1943 to November 1, 1944.) Howard J. Billings. OEMsr-1055; Service Project No. QMC-30-B. Arthur D. Little, Inc. [November, 1944.]
- M2** Theory of the ballistic resistance of flat plates and its application to doron. (Final Report [for the period] December 1, 1943 to January 31, 1945.) E. L. Thearle. OEMsr-1055; Service Project No. QMC-30-D. General Electric Company. [February, 1945.]
- M3** The Light Armor Testing Laboratory and research relating thereto. (Volume II. Final Report [for the period] October 31, 1944 to December 15, 1945.) John B. Mellecker and Walter J. Gailus. W44-109 qm-305; Service Project No. QMC-30-F. Monsanto Chemical Company. [December, 1945.]
- M4** [The] 20-mm side spray test for the evaluation of doron. (Volume II. Final Report [for the period] November 1, 1944 to December 31, 1945.) Howard J. Billings. W44-109 qm-305; Service Project No. QMC-30-B. Arthur D. Little, Inc. [January, 1946.]
- M5** Physical testing of doron. LeRoy W. Clark. OEMsr-1055; Service Project No. QMC-30-A. Rensselaer Polytechnic Institute. (n.d.)

208.3 Miscellaneous Quartermaster Corps Research

208.31 Vermin Control

- M1** Insects and other animals of interest to the Quartermaster Corps. Charles H. Blake and Henry D. Russell. OEMsr-888; Service Project No. QMC-22; OSRD No. 2091. Massachusetts Institute of Technology. September, 1943.

208.32 Troop Feeding Programs

- M1** Troop feeding programs. A survey of rationing and subsistence in the United States Army, 1775 to

1940. Samuel C. Prescott. OEMsr-929; Service Project No. QMC-23. Massachusetts Institute of Technology. March, 1944.

208.33 Substitutes for Oriental Bamboos

- M1** Western hemisphere bamboos as substitutes for oriental bamboos for the manufacture of ski pole shafts. (Final Report [for the period] April 15, 1943 to May 31, 1944.) F. A. McClure. OEMsr-1014; Service Project No. QMC-24. Smithsonian Institution. [June, 1944.]

208.34 Improvement of Shoes

- M1** Shoes, Improvement of (Final Report [for the period] December 15, 1943 to January 31, 1946.) Ernest D. Wilson. [W]44-109 qm-305; Service Project No. QMC-7. Worcester Polytechnic Institute. [February, 1946.]

208.4 Fuels for Stoves and Lanterns

208.41 Deleading Gasoline

- M1** Development of a chemical process for deleading gasoline. (n.a.) OEMsr-854; Service Project No. QMC-19; OSRD No. 3018. Ethyl [Gasoline] Corporation. December 17, 1943.
- M2** Deleading of gasoline. (Final Report [for the period] November 5, 1943 to June 30, 1945.) Morris S. Kharasch. W44-109 qm-305; Service Project No. QMC-19-A. University of Chicago. [July, 1945.]

208.42 Solid Fuels

- M1** [Solid fuels for heating combat rations.] (Summary Report [for the period] August 9, 1943 to February 29, 1944.) Charles Paul McClelland and Robert Hayward Nimmo. Service Project No. QMC-26. Mellon Institute [of Industrial Research]. [March, 1944.]
- M2** Literature search on carbonaceous fuels for heating combat rations. (Summary Report [for the period] from October 10 to December 1, 1944.) Robert Hayward Nimmo and Carol Lee Sittler. OEMsr-1055; Service Project No. QMC-26. Mellon Institute of Industrial Research. [December, 1944.]

209 Miscellaneous Research of Division 11

209.1 Manufacture of Cork Plugs

- M1** Use of substitute materials in the manufacture of cork plugs. (Report to November 1, 1941.) Earl Stafford. OEMsr-82; Service Project No. NOB-37; OSRD No. 178. Arthur D. Little, Inc. November 14, 1941.

209.2 Lead Storage Battery Capacity

- M1** Studies and investigation in connection with the possibility of increasing the capacity of lead storage batteries by modification of the negative plate. F. R. Bichowsky. OEMsr-565; Service Project No.

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- NS-110; OSRD No. 1926. Catholic University. October 16, 1943.
- 209.3 Manufacture of Nitric Acid from Urine**
- M1** Production of ammonia from urine. R. C. Wilcox. OEMsr-820; Service Project No. China-1; OSRD No. 1724. Harvard University. August 20, 1943.
- M2** Biological nitrification of urine. G. M. Fair and C. E. Renn. OEMsr-820; Service Project No. China-1; OSRD No. 3462. Harvard University. April 12, 1944.
- 300 FIRE WARFARE**
- M1** Flame throwers, incendiaries and their evaluation. Abbott Byfield, W. A. Klemm and G. A. Agoston. OEMsr-21; Service Project Nos. CWS-10 and CWS-21; OSRD No. 6190. Massachusetts Institute of Technology. October 1, 1945.
- 301 Incendiaries**
- 301.1 Bombs**
- M1** Tests conducted on incendiary program at Dugway Proving Ground, Simpson Springs, Utah, between August 3 and October 20, 1943. (Report No. PDN-1764.) H. A. Ricards, Jr. [OEMsr-354.] Standard Oil Development Company. November 5, 1943.
- M2** Modified M-52 two-pound magnesium bomb for use against Japan. E. B. Hersberg and Morrill Dakin. OEMsr-179 and OEMsr-257; Service Project No. CWS-21; OSRD No. 4521. Harvard University and Factory Mutual Research Corporation. January 1, 1945.
- 301.11 Bursters**
- M1** Dry loading of white phosphorus into burster tubes. (Report No. 303.) Howard Adler. OEMsr-296; Project Nos. CWS-21 and B-246; OSRD No. 765. Victor Chemical Works. July 24, 1942.
- M2** Recommended specifications for the white phosphorus TNT burster for the 100-lb bomb. Louis F. Fieser. [Harvard University(?)] July 24, 1942.
- M3** Comparison of M-12 and M-13 bursters in the M-47A2, 100-lb incendiary bomb. (Report No. IEP/3.) R. L. Ortynsky, Alan L. Kling and S. Murray Jones. Service Project No. CWS-21; OSRD No. 4068. August 30, 1944.
- 301.12 Fuzes**
- M1** [Design of the] E-16 Allway fuze for the AN-M69 incendiary bomb. T. L. Wheeler and Max Knobel. OEMsr-242; Service Project No. CWS-21; OSRD No. 5209. Arthur D. Little, Inc. June 15, 1945.
- 301.13 Plastic Bombs**
- M1** Development of a plastic incendiary bomb. T. S. Carswell, H. K. Nason and others. OEMsr-198; Service Project No. CWS-21; OSRD No. 6621. Monsanto Chemical Company. February 21, 1946.
- 301.14 The M-69 and Modifications**
- M1** Development of the M-69X incendiary bomb. (n.a.) OEMsr-354; Service Project No. CWS-21; OSRD No. 5254. Standard Oil Development Company. June 25, 1945.
- M2** Development of the M-69X incendiary bomb. (Supplementary Report No. PDN-4000.) (n.a.) OEMsr-354; Service Project No. CWS-21; OSRD No. 5254a. Standard Oil Development Company. September 28, 1945.
- 301.141 Stability and Flight Performance**
- M1** Third Harvard wind tunnel test on M-69 bomb. (Report No. PDN-973.) F. R. Russell and N. F. Myers. Standard Oil Development Company. April 21, 1943.
- M2** [The] M-69 flight stability tests. (Report No. PDN-1301.) J. C. Roediger. Standard Oil Development Company. May 7, 1943.
- M3** Fourth Harvard wind tunnel tests. (Report No. PDN-1480.) A. Beerbower. Standard Oil Development Company. July 27, 1943.
- M4** Strength of tail streamer assembly [of the] M-69 [bomb]. (Report No. PDN-1801.) W. T. Knox, Jr. Standard Oil Development Company. November 24, 1943.
- M5** Fifth Harvard wind tunnel tests. (Report No. PDN-1847.) A. Beerbower. Standard Oil Development Company. November 29, 1943.
- 301.142 Penetrability**
- M1** Penetration of M-69 [on] industrial targets [in] aimable clusters. (Report No. PDN-2574.) W. T. Knox, Jr. Standard Oil Development Company. June 7, 1944.
- 301.143 Efficacy**
- M1** M-69X flight tests. (Report No. PDN-3823.) W. T. Knox, Jr. Standard Oil Development Company. July 31, 1945.
- M2** M-69X functioning [in the] Day and Night [Flare Corporation] pilot plant. (Report No. PDN-3824.) W. T. Knox, Jr. Standard Oil Development Company. July 31, 1945.
- 301.144 Cluster Formation**
- M1** Striking velocity of M-69's from aimable clusters. (Report No. PDN-1822.) A. Beerbower. Standard Oil Development Company. November 26, 1943.
- M2** Development, manufacture and proof test of 10,000 M-69 clusters, Type E-6R2. (Report No. PDN-2109.) H. A. Ricards, Jr., W. T. Knox, Jr. and others. OEMsr-354. Standard Oil Development Company. April 15, 1944.
- M3** High-altitude flight tests of aimable clusters for the AN-M69 bomb. (Report No. PDN-2460.) (n.a.) OEMsr-354; Service Project No. CWS-21; OSRD No. 3761. Standard Oil Development Company. June 10, 1944.
- M4** M-69 stability from E-6R2 aimable cluster. (Report

No. PDN-2960.) W. T. Knox, Jr. Standard Oil Development Company. October 4, 1944.

301.145 Surveillance and Storage

- M1** M-69X waterproofing. (Report No. PDN-2650.) W. T. Knox, Jr. Standard Oil Development Company. June 28, 1944.
- M2** High-humidity surveillance tests [of] M-69 bombs and clusters. (Report No. PDN-3924.) G. L. Matheson. Standard Oil Development Company. September 10, 1945.

301.146 Cellocotton Filling

- M1** Use of cellocotton in [the] M-69 bomb. (Report No. PDN-950.) G. L. Matheson and Park H. Miller, Jr. OEMsr-354. Standard Oil Development Company. February 15, 1943.
- M2** The use of cellocotton in the M-69 bomb. Memorandum on work done at Kodak Park. (n.a.) OEMsr-538. [Eastman Kodak Company (?)] February 15, 1943.

301.147 Miscellaneous M-69 Problems

- M1** [The] white phosphorus grenade in M-69 obscuration tests. (Report No. PDN-3360.) H. A. Ricards, Jr. Standard Oil Development Company. March 13, 1945.

301.15 Experimental Bombs: The E-6, E-9, E-19, E-22 and E-53

- M1** The E-19, formerly E-1, magnesium bomb and its components. Louis F. Fieser and E. B. Hershberg. Harvard University. October 27, 1943.
- M2** The E-6R2 cluster. (Report No. PDN-2206.) J. C. Roediger. Standard Oil Development Company. March 3, 1944.
- M3** The E-22 500-lb bomb incendiary, tail ejection type. Norman J. Thompson. OEMsr-257; Service Project No. CWS-21. Factory Mutual Research Corporation. May 23, 1944.
- M4** Development of incendiary fuels. Rush F. McCleary and Bill L. Benge. OEMsr-898; Service Project No. CWS-21; OSRD No. 3762. The Texas Company. June 10, 1944.
- M5** [The] E-9 bomb in E-53 cluster bomb bay loading. W. S. Quimby. October 2, 1944.
- M6** [The] E-53 cluster. Its release from [a] fighter plane. W. S. Quimby. February 7, 1945.
- M7** E-9 bomb penetration tests [at] Eglin Field, Florida. W. S. Quimby. February 24, 1945.
- M8** Design and development of [the] E-19 incendiary bomb. E. B. Hershberg. OEMsr-179 and OEMsr-257; Service Project No. CWS-21; OSRD No. 4784. Harvard University, Factory Mutual Research Corporation and Morgan Construction Company. March 8, 1945.
- M9** Comparative incendiary effectiveness of the E-19 and M-50 incendiary bombs. (Project Report No. IEP/7.) Norman J. Thompson and Morrill Dakin. OEMsr-257; Service Project No. CWS-21; OSRD

No. 5023. Factory Mutual Research Corporation. April 30, 1945.

- M10** E-53 cluster tests [at] Dugway Proving Ground, July 19, 1945. (n.a.) [July, 1945.]
- M11** Static G test of E-53 cluster of 14 E-9 bombs in E-26 adapter. S. N. Arnold. Foster Wheeler Corporation. July 6, 1945.
- M12** Development of medium-sized incendiary bomb. Final report on the development of 40-pound oil incendiary bomb, E-9. (n.a.) OEMsr-898. The Texas Company. October 15, 1945.

301.16 Bomb Fillings

- M1** Experiments with alternate fillings for bomb incendiary, 9-pound E-1. Morrill Dakin. OEMsr-257. Factory Mutual Research Corporation. August 23, 1943.
- M2** Incendiary bomb fillings for industrial targets. Norman J. Thompson and Morrill Dakin. OEMsr-257 and NDCrc-231; Service Project No. CWS-21; OSRD No. 2048. Factory Mutual Research Corporation. November 23, 1943.

301.161 Cellocotton for a 500-Pound Bomb

- M1** Cellulose wadding (cellocotton) with gasoline as a fuel for a 500-lb incendiary bomb. Norman J. Thompson. OEMsr-257. Factory Mutual Research Corporation. July 28, 1943.
- M2** Gasoline-cellocotton filling for 500-pound incendiary bomb. Norman J. Thompson. OEMsr-257; Service Project No. CWS-21; OSRD No. 1702. Factory Mutual Research Corporation. August 11, 1943.

301.17 Miscellaneous Bomb Filling Problems

- M1** Use of high explosives in small incendiary bomb. Pittsburgh visit, May 15, 1942. (Report No. PDN-128.) W. T. Knox, Jr. Standard Oil Development Company. May 28, 1942.
- M2** Incendiary bomb tests at Jefferson Proving Ground, July 9 to 22, 1942. Raymond H. Ewell, Louis F. Fieser and others. July 28, 1942.
- M3** Flight tests on experimental incendiaries [at] Edgewood Arsenal. (n.a.) February 17, 1943.

301.2 Sabotage Incendiaries

301.21 Candles

- M1** Harvard candle. A pocket incendiary munition. Louis F. Fieser. OEMsr-179. Harvard University. February 25, 1942.
- M2** Observations on [the] performance of incendiary candles at Edgewood. Tests of November 30, 1942. H. C. Hottel, S. P. Lovell and Harris M. Chadwell. November, 1942.

301.22 Boxed Forms

- M1** Hand incendiaries tested at Edgewood Arsenal. Edwin A. Blair. Factory Mutual Research Corporation. October 8, 1942.

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- M2** Evaluation tests of FM sabotage incendiary. (n.a.) OEMsr-257. Factory Mutual Research Corporation. January 15, 1943.

301.23 Miscellaneous Small Incendiary Items

- M1** Test [of] fire starters E-4 and E-5. George E. Miles and J. F. McCanne. [Chemical Warfare Service] Chemical Munitions Section. August 28, 1942.
- M2** Tests of sabotage incendiaries. (n.a.) OEMsr-257; Research Project No. 457. Factory Mutual Research Corporation. October 26, 1942.
- M3** Comparison tests of hand incendiaries. (n.a.) OEMsr-257. Factory Mutual Research Corporation. January 6, 1943.
- M4** Sensitized celluloid fire leaves. Charles A. Kraus. OEMsr-57; Service Project No. CWS-11; OSRD No. 1202. Brown University. February 16, 1943.
- M5** Vest-pocket time delay incendiary. Louis F. Fieser. OEMsr-179; Service Project No. CWS-21; OSRD No. 1211. Harvard University. February 19, 1943.

301.3 Incendiary Fuel Mixtures

- M1** Comparative tests of various incendiary mixtures. ([Part I,] Report to September 10, 1941.) Louis F. Fieser. OEMsr-25; Project Nos. CWS-21 and B-117; OSRD No. 139. Harvard University. September 17, 1941.
- M2** Comparative test of various incendiary mixtures. Part II, Comparison of magnesium, thermite, SDO-sodium nitrate and a gum incendiary. (Report No. 111, to October 1, 1941.) Louis F. Fieser. OEMsr-25; Service Project No. CWS-21; OSRD No. 173. Harvard University. November 10, 1941.
- M3** Comparative tests of various incendiary mixtures. Part III, Preliminary observations on the influence of the rubber concentration and on the effect of finely powdered nitrate. (Report No. 113, to October 15, 1941.) Louis F. Fieser. OEMsr-25; Service Project No. CWS-21. Harvard University. November 10, 1941.
- M4** Comparative tests of various incendiary mixtures. Part IV, Improvements in the test procedure [and] evaluation of different types of rubber. (Report No. 132, to November 28, 1941.) Louis F. Fieser. Project Nos. CWS-21 and B-186; OSRD No. 275. Harvard University. December 8, 1941.
- M5** Experiments with incendiary mixtures. Fire test structure and development of incendiary bombs. (Report No. 277.) Norman J. Thompson. OEMsr-257; Service Project No. CWS-21; OSRD No. 657. Factory Mutual Research Corporation. June 24, 1942.
- M6** Development of incendiary mixtures. Norman J. Thompson and Edwin A. Blair. OEMsr-257; Project Nos. CWS-21 and B-231; OSRD No. 1123. Factory Mutual Research Corporation. January 13, 1943.
- M7** Study of Chemical Warfare Service IM-1 formula

modifications. (n.a.) E. I. duPont de Nemours and Company, Inc. May 19, 1943.

- M8** Synthetic polymers as gasoline thickening agents. E. C. Kirkpatrick. OEMsr-744; Service Project No. CWS-21; OSRD No. 4202. E. I. duPont de Nemours and Company, Inc. October 2, 1944.

301.4 Oil Incendiaries

- M1** The development of oil incendiary bombs. (Report No. 176.) R. P. Russell. OEMsr-183; Project Nos. CWS-21 and B-204; OSRD No. 382. Standard Oil Development Company. February 7, 1942.
- M2** The development of oil incendiary bombs. (Report No. 243.) R. P. Russell. OEMsr-183; Project Nos. CWS-21 and B-204; OSRD No. 577. Standard Oil Development Company. May 14, 1942.
- M3** The development of oil incendiary bombs. (Supplement to Report No. 243.) R. P. Russell. [OEMsr-183; Project Nos. CWS-21 and B-204;] OSRD No. 577. Standard Oil Development Company. May 14, 1942.
- M4** Rate of cooling for 500-lb cluster of 5-lb oil incendiary bombs. (Report No. PDN-121.) H. A. Ricards, Jr. Standard Oil Development Company. May 25, 1942.
- M5** Description and specifications for the 5 and 6.5-pound oil incendiary bomb. (Third Progress Report.) (n.a.) OEMsr-183; Research Project No. 199. Standard Oil Development Company. July 8, 1942.
- M6** Service tests [of] the 5 and 6-lb oil incendiary bomb [at] Jefferson Proving Ground, July 9 to 22, 1942. (Report No. PDN-222R.) N. F. Myers, W. T. Knox, Jr. and G. L. Matheson. Standard Oil Development Company. July 27, 1942.
- M7** Oil incendiary bomb, M-69X. Description of assembly methods used in semi-commercial production. (Report No. PDN-3700.) (n.a.) OEMsr-354. Standard Oil Development Company. June 20, 1945.

301.5 Efficacy of Incendiary Bombs

- M1** Incendiary tests [at] Huntsville Arsenal, Alabama, June 3 to 6, 1942. (Report No. PDN-145.) N. F. Myers. Standard Oil Development Company. June 10, 1942.
- M2** Lethal explosive charge for M-56 bomb. (Report No. PDN-429.) W. T. Knox, Jr. Research Project No. 199. Standard Oil Development Company. October 5, 1942.
- M3** Burning tests. (n.a.) Factory Mutual Research Corporation and Harvard University. November 21, 1942.
- M4** [The] AN-M-52 bomb incendiary. Optimum velocity for one-story Japanese dwellings. Norman J. Thompson and Edwin A. Blair. OEMsr-257; Service Project No. CWS-21. Factory Mutual Research Corporation. June 8, 1944.
- M5** Tests for determining incendiary value of bombs

and bomb fuels. Eugene B. Gerry. Service Project No. CWS-21; OSRD No. 4066. August 30, 1944.

- M6** Modified M-50 incendiary bomb and development of test target. Norman J. Thompson and Alan L. Kling. OEMsr-257; Service Project No. CWS-21; OSRD No. 4601. Factory Mutual Research Corporation. January 19, 1945.

302 Flame Throwers

- M1** Memorandum of meeting of group at Massachusetts Institute of Technology, Tuesday, March 3, 1942, to discuss flame throwers. H. C. Hottel. [Massachusetts Institute of Technology.] [March, 1942.]
- M2** Status of NDRC projects on flame throwers. (Report No. 272.) H. C. Hottel and G. H. Garraway. OEMsr-21, -167, -390 and -470; Service Project Nos. CWS-10, B-109 and others; OSRD No. 637. Massachusetts Institute of Technology and Standard Oil Development Company. June 20, 1942.
- M3** Report of *ad hoc* Committee on flame throwers. George A. Richter. Eastman Kodak Company. Revised: July 28, 1942.
- M4** Investigation of accident to flame thrower under development by Standard Oil Company [of] Indiana and Merz Engineering Company. (n.a.) OEMsr-1011; Service Project No. CWS-10; OSRD No. 4374. Standard Oil Company [of] Indiana and Merz Engineering Company. November 30, 1944.
- M5** Development of flame throwers, service units and thickened fuels. (Report No. PDN-4027.) (n.a.) OEMsr-390; Service Project No. CWS-21; OSRD No. 6376. Standard Oil Development Company. October 31, 1945.

302.1 Portable

302.11 Model E-2

- M1** Development of improved portable flame thrower, Design E-2. Meeting of Chemical Warfare Service-NDRC committee, January 18 to 19, 1943. T. Loew, Arthur L. Brown and N. F. Myers. January, 1943.
- M2** Design and construction [of] Model E-2 portable flame thrower. (Report No. PDN-959.) G. H. Garraway. Standard Oil Development Company. February 15, 1943.
- M3** Improved portable flame thrower, Model E-2. (Report No. PDN-1238.) G. H. Garraway. Standard Oil Development Company. April 21, 1943.
- M4** Model E-2 portable flame thrower. (Report No. PDN-1584.) N. F. Myers. Standard Oil Development Company. September 2, 1943.
- M5** Revisions to E-2 portable flame thrower. (Report No. PDN-1612.) M. D. Haworth. Standard Oil Development Company. September 18, 1943.
- M6** Manual on the operation and maintenance of the portable flame thrower, E-2. (Report No. PDN-2057.) (n.a.) OEMsr-390; Service Project No.

SPCWT-161. [Standard Oil Development Company.] February 15, 1944.

- M7** Development of portable flame thrower, E-2. (n.a.) OEMsr-390; Service Project No. CWS-10; OSRD No. 3574. Standard Oil Development Company. May 4, 1944.

302.12 Model M-1

- M1** Modifications to portable flame thrower, M-1. T. Loew, Arthur L. Brown and N. F. Myers. Factory Mutual Fire Insurance Company and Standard Oil Development Company. October 5, 1942.
- M2** Modification of portable flame thrower for thickened fuels. (Report No. 391.) N. F. Myers, G. H. Garraway and others. OEMsr-390, OEMsr-661 and OEMsr-677; Project Nos. CWS-10, B-270 and others; OSRD No. 983. Standard Oil Development Company, Factory Mutual Research Corporation and Nuodex Products Company, Inc. October 12, 1942.

302.13 Generator

- M1** Development of portable generator for repressurizing bottles for portable flame throwers. W. H. McAdams and C. C. Neas. OEMsr-1169; Service Project No. CWS-10; OSRD No. 3989. Massachusetts Institute of Technology. August 8, 1944.
- M2** Development of portable cordite-operated gas generator for pressurizing M2-A2 flame throwers. A. S. Collins and A. A. Nellis. Massachusetts Institute of Technology. July 12, 1945.
- M3** Development of a portable front line gas generator for pressurizing portable flame throwers. A. S. Collins, W. H. McAdams and others. OEMsr-1169; Service Project No. CWS-10; OSRD No. 6356. Massachusetts Institute of Technology. November 26, 1945.

302.2 Mobile Service Units

- M1** Navy flame throwers. T. V. Moore. Massachusetts Institute of Technology. February 5, 1944.
- M2** Description of mobile servicing unit for flame throwers. (Report No. PDN-2440.) S. H. Hulse and R. L. Betts. Standard Oil Development Company. April 29, 1944.
- M3** Mobile servicing unit for flame throwers. (Report No. PDN-2760. (n.a.) OEMsr-390 and OEMsr-1266. Standard Oil Development Company and Davey Compressor Company. August 23, 1944.
- M4** Letter to Brig. Gen. W. C. Kabrich. Subject: Servicing units for mechanized flame thrower. (Report No. PDN-2991.) N. F. Myers. Standard Oil Development Company. October 12, 1944.
- M5** Development of mobile servicing unit for flame throwers. (Report No. PDN-3000.) (n.a.) OEMsr-390 and OEMsr-1266; Service Project No. CWS-10; OSRD No. 4434. Standard Oil Development Company and Davey Compressor Company. December 7, 1944.

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- M6** Mobile servicing unit, E-8. Consideration of design changes. (Report No. PDN-3241.) R. L. Betts and S. H. Hulse. Standard Oil Development Company. January 5, 1945.
- M7** [The] E-12-7R1 and E-7-LVTA1 servicing units. (Report Nos. PDN-3285 and PDN-3288.) N. F. Myers. Standard Oil Development Company. January 17, 1945.
- M8** Service unit, E-8, for use with mechanized flame throwers. (Report No. PDN-3500.) (n.a.) OEMsr-390; Service Project No. CWS-10; OSRD No. 5127. Standard Oil Development Company. May 29, 1945.
- M9** Development of mobile service equipment for mechanized flame throwers. (Final Report No. PDN-3975.) (n.a.) OEMsr-390; Service Project No. CWS-10; OSRD No. 6014. Standard Oil Development Company. October 18, 1945.
- 302.3 Mechanized**
- M1** Design and development of large experimental flame thrower. D. C. Elliott. OEMsr-470; Service Project No. CWS-10; OSRD No. 1952. Gilbert and Barker Manufacturing Company. October 25, 1943.
- 302.31 Scorpion, or Skink**
- M1** The Scorpion. T. L. Wheeler and A. Bogrow. OEMsr-242; Service Project No. CWS-21. Arthur D. Little, Inc. February 7, 1945.
- M2** The Skink, formerly Scorpion. Allen Latham, Jr. Arthur D. Little, Inc. April 12, 1945.
- 302.32 Flame Throwers, Mounted on Tanks**
- 302.321 Amphibious Tanks (LVT) Using Models E-7 and E-14 Flame Throwers**
- M1** [The] E-7(Q)-LVT-A1 Lima locomotive installation. (Report No. PDN-2196.) M. D. Haworth. Standard Oil Development Company. March 1, 1944.
- M2** Mechanized flame thrower, E-14-7R2, with thickened fuel mixer, E-6, and air compressor, E-8. (Report No. PDN-3790.) (n.a.) Standard Oil Development Company and Davey Compressor Company. July 20, 1945.
- M3** [The] E-14-7R2 mechanized flame thrower installed in LVT-A1 amphibious tank. (Report No. PDN-4026.) (n.a.) OEMsr-390; Service Project No. CWS-10; OSRD No. 6351. Standard Oil Development Company. October 31, 1945.
- M4** Fuel and nozzle study. The E-14-7R2 flame thrower in LVT-A1 amphibious tank. (Report No. PDN-4112.) J. O. Collins. Standard Oil Development Company. January 18, 1946.
- 302.322 Model M-4 Tanks Using Models E-5, E-7, E-12, E-13 and E-19 Flame Throwers**
- M1** Demonstration of mechanized flame thrower, E-12-7R1, and servicing unit E-8 for Chemical Warfare Service. (Report No. PDN-3370.) (n.a.) February 22, 1945.
- M2** Mechanized flame thrower, E-12-7R1, and mechanized flame thrower service unit, E-8. (Report No. PDN-3499.) (n.a.) Standard Oil Development Company, M. W. Kellogg Company and Davey Compressor Company. April 2, 1945.
- M3** Development of mechanized flame thrower, E-13R1-13R2, in M-4A1 tank. T. V. Moore and T. R. Camp. OEMsr-21 and OEMsr-1364; Service Project No. CWS-10; OSRD No. 4980. Massachusetts Institute of Technology. April 30, 1945.
- M4** Mechanized flame thrower, E-12-7R1, installed in medium tank, M-4A1. (n.a.) OEMsr-390; Service Project No. CWS-10; OSRD No. 5126. Standard Oil Development Company. May 29, 1945.
- M5** Inspection and field operational tests of 20 E-12-7R1 flame throwers. (Report No. PDN-3672.) J. O. Collins. Standard Oil Development Company. June 6, 1945.
- M6** Joint Chemical Warfare Service-NDRC mechanized flame thrower evaluation project. A. W. Adkins, G. A. Agoston and others. OEMsr-21; Service Project No. CWS-10; OSRD No. 5933. Massachusetts Institute of Technology. June 30, 1945.
- M7** Development and field use of E-7-7 mechanized flame thrower. (n.a.) OEMsr-390; Service Project No. CWS-10; OSRD No. 6012. Standard Oil Development Company. September 12, 1945.
- M8** [The] E-13-13 flame gun and equipment in M-4A1 tank. Myles Morgan. OEMsr-1364; Service Project No. CWS-10; OSRD No. 5711. Morgan Construction Company. September 17, 1945.
- M9** Design of mechanized flame thrower in M-4A3 tank retaining 76-mm gun. H. O. Croft, J. M. Trummel and others. OEMsr-1480; Service Project No. CWS-10; OSRD No. 6015. State University of Iowa. September 30, 1945.
- M10** [The] M-5-4 (E-12-7R1) mechanized flame thrower installed in M-4A1 or M-4A3 medium tanks. (n.a.) OEMsr-390; Service Project No. CWS-10; OSRD No. 6350. Standard Oil Development Company. October 31, 1945.
- 302.323 Model M-5 Tanks Using Models E-7 and Q Flame Throwers**
- M1** Mobile flame thrower, Model Q. (Report No. PDN-1158.) G. H. Garraway. Standard Oil Development Company. April 6, 1943.
- M2** General specifications [of the] Model Q tank-borne flame thrower. (Report No. PDN-1378.) G. H. Garraway. Standard Oil Development Company. June 2, 1943.
- M3** Standard Oil Company of Indiana [and] Merz Engineering Company mechanized flame throwers. T. V. Moore. August 14, 1943.
- M4** Description of Indiana-Merz flame thrower. T. V. Moore. October 10, 1943.
- M5** Description of C. F. Braun and Company flame

thrower. G. P. Klaas. [C. F. Braun and Company.] October 27, 1943.

M6 Letter to Mr. T. V. Moore. Subject: Additional information about design of flame thrower for M-5 tank. G. P. Klaas. C. F. Braun and Company. December 13, 1943.

M7 Description of C. F. Braun and Company flame thrower. G. P. Klaas. [C. F. Braun and Company.] August 8, 1944.

M8 Demonstration of Klaas-Braun flame thrower, October 10, 1944. Charles S. Keevil. October 13, 1944.

M9 Development of flame thrower for M-5 tank. (n.a.) OEMsr-1011; Service Project No. CWS-10; OSRD No. 4432. Standard Oil Company of Indiana. December 6, 1944.

M10 Mechanized flame thrower, E-7-7, installed in light tank, M-5A1. (n.a.) OEMsr-390; Service Project No. CWS-10; OSRD No. 5125. Standard Oil Development Company. May 29, 1945.

M11 [The] E-7-7 mechanized flame thrower in M-5A1 light tank. NDRC operational tests. (Report No. PDN-3772.) G. W. Engisch. Standard Oil Development Company. July 12, 1945.

M12 Development of mobile flame thrower. G. P. Klaas. OEMsr-943; Service Project No. CWS-10; OSRD No. 5443. C. F. Braun and Company. August 12, 1945.

302.33 Miscellaneous Tank Flame Throwers

M1 A simplified form of flame throwing mechanism, Model I. R. L. Iglehart and R. D. Dawson. OEMsr-916; Service Project No. CWS-10. Shell Development Company. March 15, 1944.

M2 Mechanized flame thrower, Model I-3. R. D. Dawson and A. S. Grundy. OEMsr-916; Service Project No. CWS-10; OSRD No. 4983. Shell Development Company. April 24, 1945.

302.4 Pump-Operated Flame Thrower

M1 Preliminary study of the application of pumps to flame throwers. T. V. Moore. OEMsr-21; Service Project No. CWS-10. Massachusetts Institute of Technology. April 20, 1944.

M2 Further study of the application of pumps to flame throwers. Abbott Byfield. OEMsr-21; Service Project No. CWS-10. Massachusetts Institute of Technology. February 26, 1945.

M3 A comparison of space requirements for flame throwers propelled by pumps and by compressed gas. Abbott Byfield. Massachusetts Institute of Technology. May 7, 1945.

M4 Trip to Eastman Kodak of May 25, 1945. H. C. Hottel. Massachusetts Institute of Technology. May 26, 1945.

M5 Agreements reached at Rochester Conference on development of pump-operated flame thrower, August 3, 1945. H. C. Hottel. Massachusetts Institute of Technology. August 6, 1945.

302.5 Flame Attack and Countermeasures

302.51 Attack

M1 Use of flame on Japanese bunkers. (n.a.) OEMsr-390; Service Project No. CWS-10; OSRD No. 2090. Standard Oil Development Company. December 4, 1943.

302.52 Protection of Ship Conning Towers

M1 Conning tower port plugs. T. L. Wheeler and Roger C. Griffin. OEMsr-242. Arthur D. Little, Inc. May 21, 1945.

M2 Protection of ship conning towers. T. L. Wheeler, Roger C. Griffin and Arthur L. Brown. OEMsr-242; Service Project No. NS-317; OSRD No. 5356. Arthur D. Little, Inc. July 19, 1945.

M3 Protection of ship conning towers. T. L. Wheeler and Roger C. Griffin. OEMsr-242; Service Project No. NS-317; OSRD No. 6013. Arthur D. Little, Inc. September 17, 1945.

302.53 Miscellaneous Attack and Countermeasure Research

M1 Countermeasures against flame. Memorandum of conference on Project NS-317, September 22, 1944. H. C. Hottel. Service Project No. NS-317. Arthur D. Little, Inc. September 23, 1944.

M2 Studies of special thrower fuels and development of countermeasures against flame throwing equipment. (Monthly Progress Report covering period [from] January 15 to February 15, 1945.) T. L. Wheeler and A. Bogrow. OEMsr-242; Service Project No. CWS-21 and NS-317. Arthur D. Little, Inc. February 19, 1945.

303 Fuels for Incendiaries and Flame Throwers

M1 Development of flame throwers. (Monthly Progress Report for period from July 15 to August 15, 1942.) (n.a.) OEMsr-390. [Standard Oil Development Company.] August 15, 1942.

M2 Development of flame throwers. (Monthly Progress Report covering period from September 15 to October 15, 1942.) (n.a.) OEMsr-390. [Standard Oil Development Company.] November 15, 1942.

M3 Field tests on flame throwers, Model C. (Monthly Progress Report covering period [from] April 15 to May 15, 1943.) Hugh Harvey. OEMsr-916; Service Project No. CWS-10. Shell Development Company. May 15, 1943.

M4 Study of mechanized flame throwers. (Monthly Progress Reports covering period from May 15 to August 15, 1943.) R. D. Dawson. OEMsr-916; Service Project No. CWS-10. Shell Development Company.

M5 Fuel recommendations for E-12-7R1 flame thrower. A. W. Adkins. Edgewood Arsenal. June 23, 1945.

M6 Studies of thickened liquids and miscellaneous flame thrower problems. E. E. Bauer and E. K. Carver. OEMsr-538; Service Project Nos. CWS-10, CWS-12 and CWS-21; OSRD No. 6236. Eastman Kodak Company. October 23, 1945.

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303.1 Thickened Fuels

- M1** Studies of thickened liquids. (Monthly Progress Reports covering period [from] April 15, 1943 to August 15, 1945.) E. K. Carver, E. E. Bauer and others. OEMsr-538; Service Project Nos. CWS-10, CWS-12 and CWS-21. Eastman Kodak Company.
- M2** Rheological properties of thickened liquids. (Second Report.) E. K. Carver and John R. Van Wazer, Jr. OEMsr-538; Service Project Nos. CWS-10, CWS-12 and CWS-21; OSRD No. 1389. Eastman Kodak Company. May 7, 1943.
- M3** Studies of special [thickened] flame thrower fuels. Frederick S. Bacon and A. Bogrow. OEMsr-242; Service Project No. CWS-21. Arthur D. Little, Inc. April 20, 1944.

303.11 Napalm Soaps and Soap-Thickened Fuels

- M1** Memorandum on incendiaries. Louis F. Fieser. Harvard University. February 25, 1942.
- M2** Letter to R. H. Ewell. Subject: Thickened fuels. Henry Gould. Nuodex Products Company, Inc. September 10, 1942.
- M3** History of napalm. Louis F. Fieser. September 24, 1942.
- M4** Compound X-104-B, Formula No. 1. Arthur Minich. [Nuodex Products Company, Inc.] November 14, 1942.
- M5** Letter to H. C. Hottel. Subject: The inhibition of the oxidation of napalm soap. E. R. White. Shell Development Company. August 30, 1943.
- M6** Studies of thickened liquids. (Monthly Progress Report covering period [from] October 15 to November 15, 1943.) G. Broughton and E. K. Carver. OEMsr-538; Service Project Nos. CWS-10, CWS-12 and CWS-21. Eastman Kodak Company. November 15, 1943.
- M7** The manufacture, properties and testing of napalm soaps. G. Broughton and Abbott Byfield. Service Project Nos. CWS-10 and CWS-21; OSRD No. 2036. Eastman Kodak Company. November 17, 1943.
- M8** The preparation and properties of aluminum naphthenate soaps. S. B. Elliott. OEMsr-882. Ferro Drier and Chemical Company. January 3, 1944.
- M9** The manufacture, properties and testing of napalm soaps. G. Broughton and Abbott Byfield. Service Project Nos. CWS-10 and CWS-21; OSRD No. 2036a. Eastman Kodak Company. March 7, 1944.
- M10** Fundamental study of the structure and characteristics of soap-thickened fuels. (Report covering period [from] May, 1943 to June, 1944.) J. W. McBain. OEMsr-1057; Service Project Nos. CWS-10 and CWS-21; OSRD No. 4205. Stanford University. [June, 1944.]
- M11** Aluminum soaps for thickening gasoline. G. H. McIntyre and S. B. Elliott. OEMsr-882; Service Project Nos. CWS-10 and CWS-21; OSRD No. 3772. Ferro Drier and Chemical Company. June 13, 1944.

M12 Meeting to consider eliminating naphthenic acids from the napalm formula [at] Dumbarton Oaks, November 3, 1944. E. E. Bauer. Eastman Kodak Company. November 17, 1944.

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M15 Production of thickened fuels using fast setting napalm at high temperatures. (Report No. PDN-3900.) (n.a.) OEMsr-390; Service Project No. CWS-10; OSRD No. 6011. Standard Oil Development Company. August 31, 1945.

M16 A study of aluminum soaps for thickening gasoline. K. E. Long and John Dickenson. OEMsr-847; Service Project Nos. CWS-10 and CWS-21; OSRD No. 6349. Harshaw Chemical Company. September 30, 1945.

303.12 Gasoline Gels

M1 Production of incendiaries from acetylene. Polymers (divinyl-acetylene and synthetic drying oil). (Report to September 15, 1941.) Louis F. Fieser. OEMsr-25; Project Nos. CWS-21 and B-117; OSRD No. 174. Harvard University. November 10, 1941.

M2 Properties and examination of IM, Type III incendiary fuel. E. C. Kirkpatrick. E. I. duPont de Nemours and Company, Inc. April 26, 1943.

M3 Invention report on incendiaries. Part I, Gelled fuels of the napalm type. Benton A. Bull. May 1, 1943.

M4 The stability of incendiary gels. (First Report.) (n.a.) OEMsr-538. Eastman Kodak Company. June 7, 1943.

M5 The use of fortified fuel in flame throwers, incendiary bombs and incendiary mortars, with an appendix on: Turpentine-carbon disulfide gels as flame thrower fuels. Norman J. Thompson, E. M. Cousins and Edwin A. Blair. OEMsr-257; Service Project Nos. CWS-10 and CWS-21; OSRD No. 3196. Factory Mutual Research Corporation. January 29, 1944.

M6 Performance of thickened fuels in flame thrower, Model E-7 (Q). (Report No. PDN-2105.) R. L. Betts. Standard Oil Development Company. February 14, 1944.

M7 Flame thrower fuels. R. D. Dawson and E. R. White. OEMsr-916; Service Project No. CWS-10; OSRD No. 3506. Shell Development Company. April 20, 1944.

M8 Consistency of napalm gels. E. K. Carver and E. E. Bauer. OEMsr-538; Service Project Nos. CWS-10

and CWS-21; OSRD No. 3508. Eastman Kodak Company. April 20, 1944.

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M10 The mechanized Gardner mobilometer. E. L. McMillen and F. K. Carver. OEMsr-538; Service Project Nos. CWS-10 and CWS-21; OSRD No. 6234. Eastman Kodak Company. October 30, 1945.

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M1 Phosphorus-sulphur flame thrower fuel. T. L. Wheeler and L. B. Arnold, Jr. OEMsr-242; Service Project No. CWS-21; OSRD No. 5355. Arthur D. Little, Inc. June 15, 1945.

M2 Phosphorus-phosphorus sesquisulfide eutectic as a special flame thrower fuel. T. L. Wheeler and A. Bogrow. OEMsr-242; Service Project No. CWS-10; OSRD No. 5523. Arthur D. Little, Inc. August 3, 1945.

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M4 Thickened eutectic white phosphorus fuels and ejection devices for EWP fuels. (Supplementary report.) T. L. Wheeler and J. J. Clancy. OEMsr-242; Service Project No. CWS-10; OSRD No. 5524a. Arthur D. Little, Inc. October 22, 1945.

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M1 Aluminum cresylate from petroleum cresylic acids. G. C. Brock and A. G. Orr. OEMsr-1468; Service Project No. CWS-10; OSRD No. 6237. California Research Corporation. September 29, 1945.

303.2 Mixers

M1 Self-powered portable mixing unit. C. E. Reed. April 19, 1945.

M2 Ferro-cleaver Brooks mixer. E. K. Carver. October 5, 1945.

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M1 Effect of white phosphorus on ignition of incendiary fuels in M-56 bombs. (Report No. PDN-441.) R. L. Betts. Research Project No. 199. Standard Oil Development Company. October 8, 1942.

M2 Comparison tests on new ignitors and bursters. A report on tests using three M-46A2 bombs fired on Soldiers Field, October 1, 1942. E. B. Hershberg. Harvard University. October 13, 1942.

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M4 Chemical ignition of flame throwers. E. C. Kirkpatrick. OEMsr-744; Service Project No. CWS-10;

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303.4 Factors Affecting Range

303.41 Wind

M1 The effect of wind on flame thrower range. (n.a.) OEMsr-21; Service Project No. CWS-10. Massachusetts Institute of Technology. February 10, 1944.

M2 [The] US Navy Mark I flame thrower. Effect of operating pressure and wind on range. (Report No. PDN-2602.) J. O. Collins. Standard Oil Development Company. June 19, 1944.

303.42 Liquid Jet Structure

M1 Study of disintegration of liquid jets in air. H. C. Hottel and L. W. Russum. October 23, 1941.

303.43 Nozzle Size and Design

M1 Studies on fuel projection from nozzles. (Report No. 261.) H. C. Hottel. OEMsr-21; Project Nos. CWS-10 and B-109; OSRD No. 615. Massachusetts Institute of Technology. June 8, 1942.

M2 Flow of napalm-thickened gasoline in pipes and nozzles. Arthur L. Brown and C. W. Cousins. OEMsr-661; Service Project No. CWS-10; OSRD No. 3522. Factory Mutual Research Corporation. April 25, 1944.

303.44 Gel Properties

M1 Properties of thixotropic, dilatant and other fluids. (Progress Report Nos. 10 and 11.) G. Broughton and E. K. Carver. OEMsr-538. Eastman Kodak Company. March 15 and April 15, 1943.

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304.1 Wood

M1 Wood flammability under various conditions of irradiation. (Report No. 195.) H. C. Hottel. Project Nos. CWS-21 and B-205; OSRD No. 432. Massachusetts Institute of Technology. March 3, 1942.

M2 Ignitability of various woods. Norman J. Thompson and Morrill Dakin. OEMsr-257. Factory Mutual Research Corporation. June 21, 1943.

M3 Burning tests of vertical planks. Norman J. Thompson and Alan L. Kling. OEMsr-257. Factory Mutual Research Corporation. November 27, 1944.

304.11 Moist Wood

M1 The inflammability of wood as affected by moisture content. (Report No. IEP/2.) Richard F. Messing. Service Project No. CWS-21; OSRD No. 4067. NDRC, Office of Field Service. August 30, 1944.

M2 Moisture content of wood in Japan. H. C. Hottel. November 14, 1944.

M3 Moisture content of wood. Incendiary test struc-

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tures. (Report No. PDN-3150.) H. A. Ricards, Jr. Standard Oil Development Company. December 18, 1944.

- M4** The effect of moisture on ignition and burning characteristics of Douglas fir. (Report No. IEP/6.) Norman J. Thompson and Alan L. Kling. OEMsr-257; Service Project No. CWS-21; OSRD No. 4797. Factory Mutual Research Corporation. March 16, 1945.

- M5** Studies in wood moisture content. (Report No. IEP/6.) George R. Stanbury, Raymond H. Ewell and Richard F. Messing. Service Project No. CWS-21; OSRD No. 4988. Edgewood Arsenal. April 27, 1945.

304.2 Destruction of Models

- M1** Evaluation of incendiary fuels and bombs on industrial building occupancies. (Report No. IEP/4.) Norman J. Thompson and Alan L. Kling. OEMsr-257; Service Project No. CWS-21; OSRD No. 4468. Factory Mutual Research Corporation. December 15, 1944.

- M2** Design and testing of a simple target structure to simulate typical industrial incendiary centers. (Report No. IEP/5.) Norman J. Thompson and Alan L. Kling. OEMsr-257; Service Project No. CWS-21; OSRD No. 4469. Factory Mutual Research Corporation. December 15, 1944.

- M3** The comparative effectiveness of small incendiary bombs on industrial targets. (Report No. IEP/9.) Charles S. Keevil. OEMsr-21; Service Project No. CWS-21; OSRD No. 6189. Edgewood Arsenal. October 3, 1945.

304.21 Foreign Types of Buildings

- M1** Penetration of M-50, M-69 and M-69X [bombs] into typical Rhineland structure. (Report No. PDN-1201.) (n.a.) OEMsr-354. Standard Oil Development Company. April 15, 1943.

- M2** Design and construction of typical German and Japanese test structures at Dugway Proving Ground, Utah. (Report No. PDN-1340.) (n.a.) OEMsr-354. Standard Oil Development Company. May 27, 1943.

- M3** German industrial structures. Their construction and probable penetration by incendiary bombs. (Report No. PDN-1558.) (n.a.) OEMsr-354. Standard Oil Development Company. September 11, 1943.

- M4** Commentary on incendiary tests at Dugway Proving Ground, Utah, May 17 to July 16, 1943. (Report No. PDN-1566.) (n.a.) OEMsr-354. Standard Oil Development Company. September 13, 1943.

- M5** Incendiary tests in experimental Japanese room. (Report No. IEP/8.) Charles S. Keevil. Service Project No. CWS-21; OSRD No. 5120. Edgewood Arsenal. May 26, 1945.

- M6** Penetration and performance tests of small incendiary bombs in a typical central German structure. (n.a.) OEMsr-354; Service Project No. CWS-21; OSRD No. 5522. Standard Oil Development Company. July 30, 1945.

- M7** Evaluation of incendiary fuels in German attic and subattic structures. (Report No. PDN-3950.) (n.a.) OEMsr-354. Standard Oil Development Company. September 28, 1945.

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- M2** Amphibian scout car. Design No. 402-6; Stevens Model No. 397-1. (n.a.) Sparkman and Stephens, Inc. November 22, 1941.

- M3** Letter to Palmer C. Putnam. Subject: The QMC-4. General purpose amphibian truck. (Interim Report No. 2.) Roderick Stephens, Jr. Sparkman and Stephens, Inc. December 13, 1941.

- M4** Amphibian scout car. Design No. 402-6; Stevens Model No. 397-2. (n.a.) Sparkman and Stephens, Inc. December 16, 1941.

- M5** [The] QMC-4. [General purpose amphibian truck.] (Interim Report No. 3 [for the period from] December 5 to December 30, 1941.) [Roderick Stephens, Jr., Sparkman and Stephens, Inc.] [December 30, 1941.]

- M6** Letter to Palmer C. Putnam. Subject: Continuance of QMC-4 [general purpose amphibious truck] development by Marmon-Herrington Company. Roderick Stephens, Jr. Sparkman and Stephens, Inc. December 30, 1941.

- M7** Operator's instruction manual for Ford amphibian 1/4-ton 4 x 4, USA Registry Numbers: 702104-709999 Inc.; 7010000-7012103 Inc.; 7012105-7014882 Inc. (n.a.) Contract No. W-398-QM-12937 (W-374-ORD-2782). Ford Motor Company. [1942.]

- M8** [The] QMC-4. [General purpose amphibian truck] Ford Model No. 1. Test program. (n.a.) January 26, 1942.

- M9** [The] QMC-4. [General purpose amphibian truck.] (Interim Report No. 4, for January, 1942.) Roderick Stephens, Jr. Sparkman and Stephens, Inc. February 2, 1942.

- M10** Letter to Roderick Stephens, Jr. Subject: Self-propelled model of the amphibian scout car. Backing tests of February 4, 1942. W. C. Hugli, Jr. Stevens Institute of Technology. February 5, 1942.

- M11** Self-propelled tests on amphibian scout car. Stevens Model No. 397 test data. (n.a.) Sparkman and Stephens, Inc. February 5, 1942.

- M12** [The] QMC-4. Scale model testing [of the general purpose amphibian truck]. (Supplementary Report [for the period] from September 23, 1941 to February 25, 1942.) Roderick Stephens, Jr. Sparkman and Stephens, Inc. February 25, 1942.

- M13** [The] QMC-4. Full scale tests for No. 1 pilot model

[general purpose amphibian truck]. (General Summary [for the period] from February 9, 1942 to February 21, 1942.) Roderick Stephens, Jr. Sparkman and Stephens, Inc. February 26, 1942.

- M14** [The] QMC-4. [General purpose amphibian truck.] (Interim Report No. 5, for February, 1942.) Roderick Stephens, Jr. Sparkman and Stephens, Inc. February 28, 1942.

- M15** [The] QMC-4. [General purpose amphibian truck.] (Report No. 6, for March, 1942.) Roderick Stephens, Jr. Sparkman and Stephens, Inc. March, 1942.

- M16** The 1/4-ton 4 x 4 amphibian car T-1, Ford No. 1. Frederick J. Bogardus. US War Department, Engineer Board, Fort Belvoir, Virginia. March 25, 1942.

- M17** Letter to Roderick Stephens, Jr. Subject: Brake and other tests, GPA Unit No. 2, commencing April 18, 1942. James B. Murray. Sparkman and Stephens, Inc. May 1, 1942.

- M18** [The] QMC-4. [Full scale trials of general purpose amphibian truck.] (Interim Report No. 7, for April, 1942.) Roderick Stephens, Jr. Sparkman and Stephens, Inc. May 14, 1942.

- M19** Specifications [of] amphibious reconnaissance car, 1/4-ton 4 x 4 model. (n.a.) Ford Motor Company. August 18, 1942.

- M20** [The] 1/4-ton amphibian weapons carrier test conducted at Camp Elliot, California, by the California Institute of Technology. C. F. Kramer. Ford Motor Company. February 23, 1943.

- M21** The 1/4-ton 4 x 4 amphibian trucks. (Intelligence Summary No. 169.) (n.a.) Contract No. TB-12-15-WD. US War Department, Ordnance Intelligence Unit, Service Branch. April 16, 1943.

- M22** Amphibious equipment and vehicles designed by Sparkman and Stephens, Inc. (Preliminary Summary Report [for the period from] May, 1941 to August, 1943.) Lawrence G. Hecker. [Sparkman and Stephens, Inc.] [November, 1943.]

- M23** Development and tests of the 1/4-ton 4 x 4 GPA amphibian, QMC-4. (n.a.) OEMsr-143; Sparkman and Stephens Job No. 402. Sparkman and Stephens, Inc. July 4, 1944.

- M24** The 1/4-ton 4 x 4 amphibian, built by Marmon-Herrington for . . . Division 12, NDRC. Roger S. Warner, Jr. OEMsr-182. September 26, 1944.

- M25** Development and tests of the 1/4-ton 4 x 4 GPA amphibian, QMC-4. Final report of July 4, 1944, Sparkman and Stephens Job No. 402; rewritten November 22, 1944 to incorporate suggestions of Roderick Stephens, Jr. [Lawrence G. Hecker.] Sparkman and Stephens Job No. 402. Sparkman and Stephens, Inc. December 30, 1944.

- M26** Amphibious vehicle design. Clifford J. Nuttall, Jr. and Lawrence G. Hecker. OEMsr-154; Sparkman and

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- M1** General Motors Truck and Coach amphibian, Model DUKW-353. Characteristics and photographs. (n.a.) General Motors Corporation, GMC Truck and Coach Division and Sparkman and Stephens, Inc. June 12, 1942.
- M2** The 2½-ton amphibian, DUKW. (Interim Report Nos. 4 to 13, 16, 20 to 21 and 24 to 25 [covering the period] July, 1942 to May, 1944.) Roderick Stephens, Jr. Sparkman and Stephens, Inc.
- M3** Model DUKW-353, 6 x 6 amphibious truck. Tentative specification. E. W. Allen. General Motors Corporation, GMC Truck and Coach Division. Revised: August 8, 1942.
- M4** Model DUKW-353. (n.a.) General Motors Corporation, GMC Truck and Coach Division. October 10, 1942.
- M5** Tire tests on coral rock [of] General Motors Corporation truck-amphibian, Model DUKW-353. (Problem No. 59.) H. W. Delzell. B. F. Goodrich Company. [February, 1943.]
- M6** The 2½-ton amphibian truck and trailer. Hartley Rowe. Service Project No. OD-92. General Motors Corporation, GMC Truck and Coach Division. February 16, 1943.
- M7** Truck track. DUKW spreading equipment. (Series No. 7; Drawing 119-A.) O. F. Arthur. Tri-State Engineering Company. May, 1943.
- M8** Ship-to-shore airplane ferry employing catamaran consisting of two DUKW-353 and catamaran kit. (n.a.) General Motors Corporation, GMC Truck and Coach Division. November 22, 1943.
- M9** Development of the DUKW and related projects. [The] 2½-ton 6 x 6 amphibious truck. C. O. Ball. OEMsr-870. General Motors Corporation, GMC Truck and Coach Division. [1944.]
- M10** Army 2½-ton amphibian truck 6 x 6, General Motors Corporation DUKW-353. Roderick Stephens, Jr. OEMsr-154. Sparkman and Stephens, Inc. November 7, 1944.
- M11** The truck becomes a DUKW. (n.a.) General Motors Corporation. [October, 1945.]

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- M2** Preventive maintenance for DUKW, Model 353. (n.a.) General Motors Corporation, GMC Truck and Coach Division. [December, 1942.]
- M3** DUKW amphibious operation. (Second Edition.) (n.a.) General Motors Corporation, GMC Truck and Coach Division. [May, 1943.]
- M4** DUKW troubles and suggested cures. Roderick Stephens, Jr. Sparkman and Stephens, Inc. July 9, 1943.
- M5** [The] DUKWs. Report on trip to United Kingdom,

May 9 to July 1, 1943. Roderick Stephens, Jr. Sparkman and Stephens, Inc. July 12, 1943.

- M6** The 2½-ton amphibian trucks. Report on DUKWs. [Frank Speir.] [US War Department(?)] October, 1943.
- M7** [The] DUKW. Buffalo tests, conducted by [the] US Navy. Roderick Stephens, Jr. Sparkman and Stephens, Inc. October 5, 1943.
- M8** Care of DUKWs on shipboard during combat shipment. Weight without payload 14,500 lbs. Roderick Stephens, Jr. Sparkman and Stephens, Inc. October 25, 1943.
- M9** [The DUKW.] Operational hints. Roderick Stephens, Jr. Sparkman and Stephens, Inc. October 25, 1943.
- M10** [The DUKW.] Observations and suggestions based on . . . visit to AVTC, Charleston, South Carolina, October 28, 1943. Roderick Stephens, Jr. Sparkman and Stephens, Inc. [November, 1943(?)]
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- M13** DUKW mooring at ship's side. Roderick Stephens, Jr. Sparkman and Stephens, Inc. Revised: November 17, 1943.
- M14** Care of DUKWs on shipboard during combat shipment. Weight without payload 14,500 lbs. Roderick Stephens, Jr. Sparkman and Stephens, Inc. Revised: November 17, 1943.
- M15** Landing problems using LSTs, DUKWs, Buffaloes and Alligators. Report of observations by D. Puleston, . . . of [tests] carried out near Puni Puni on November 16 and 17, 1943. . . . Palmer C. Putnam. November 21, 1943.
- M16** Recommendations relating to DUKWs. Palmer C. Putnam. November 22, 1943.
- M17** The DUKW. Its operation and uses. (n.a.) US War Department, Headquarters United States Army Forces, Pacific Ocean Areas. October 15, 1944.
- M18** DUKW operations. Survey at Okinawa, as of July 5, 1945. Dennis Puleston. [1945.]
- M19** The DUKW. Its operation and uses, with changes and additions. Colby M. Meyers. US War Department, Headquarters, 4th Engineer Special Brigade. March 26, 1945.
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- M1** The Weasel, US M-29. Snow, mud and deep water operations. (n.a.) Studebaker Corporation. [January, 1944.]

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- M2** Track-propelled amphibians and conversions that Sparkman and Stephens, Inc. has assisted in developing. The use of completely submerged tracks for propulsion in the water. Lawrence G. Hecker and Clifford J. Nuttall, Jr. Sparkman and Stephens Job No. 500. Sparkman and Stephens, Inc. May 31, 1944.
- M3** Weasel snow vehicle. (n.a.) OEMsr-154; Sparkman and Stephens Job No. 437. Sparkman and Stephens, Inc. July 17, 1944.
- M4** The Weasel. A paper to be presented March 19, 1945 before the Society of Automotive Engineers. H. E. Churchill. March 19, 1945.
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- M1** Photograph. Subject: Motors for snow and ice. The automobile adapted to the sleigh. *London Illustrated News*. 1908, Volume 132, p. 60.
- M2** Photograph. Subject: A novel motor sleigh [invented by Remizi]. *Horseless Age*. February 24, 1912.
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- M4** Photograph. Subject: Radantrieb. *Der Motorwagen*. December 20, 1921, p. 205.
- M5** Photographs. Subject: Cargo carrier, light T-15. (Albums A and B.) Studebaker Corporation. [1942.]
- M6** Development of Weasel, with notes on problems of its use. Palmer C. Putnam. October 14, 1942.
- M7** Development of Weasel, with notes on problems of its use. Palmer C. Putnam. November 2, 1942.
- M8** Brief chronological history of the development program of T-15, between May 17, 1942 and November 2, 1942. (Volumes I, II and III.) (n.a.) Studebaker Corporation. [November 2, 1942.]
- M9** Cargo carrier, light T-15. General specifications, dimensional layout, outline drawing. (n.a.) Studebaker Corporation. [November 4, 1942.]
- M10** Summary of T-15 tests made at Studebaker Proving Ground and the Columbia Ice Fields. (n.a.) Studebaker Corporation. November 20, 1942.
- M11** Letter to Palmer C. Putnam. Subject: Flynn's snow motor. (Blueprint of snow tractor attached.) Roy E. Cole. Studebaker Corporation. April 16, 1945.
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- M2** The development [of] the T-15 cargo carrier. (n.a.) Studebaker Corporation. March 29, 1943.
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- M2** Ark, amphibious conversion of Weasel. The M-29 light cargo carrier. (n.a.) OEMsr-154; Sparkman and Stephens Job No. 462. Sparkman and Stephens, Inc. July 17, 1944.
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- M1** Esch device. [An] amphibian based on 76-mm gun motor carriage, M-18. Lawrence G. Hecker. Sparkman and Stephens Job No. 484. Sparkman and Stephens, Inc. June 25, 1944.
- M2** Tests and modifications on the amphibious 76-mm gun motor carriage, T-86, in the period August 10, 1944 to September 1, 1944 at the Aberdeen Proving Ground, Maryland and Rehoboth Beach, Delaware. Clifford J. Nuttall, Jr. Sparkman and Stephens Job No. 484. Sparkman and Stephens, Inc. September 8, 1944.
- M3** Amphibious 76-mm gun motor carriage, T-86. Report of landing vehicle board trials at Fort Ord, California. Lawrence G. Hecker. Sparkman and Stephens, Inc. October 11, 1944.
- M4** Amphibian based on 76-mm gun motor carriage, M-18. Lawrence G. Hecker. OEMsr-154; Sparkman and Stephens Job No. 484. Sparkman and Stephens, Inc. December 30, 1944.
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- M1** Pelican studies. [The] 6-ton 6 x 6 amphibians. (n.a.) OEMsr-154; Sparkman and Stephens Job No. 435. Sparkman and Stephens, Inc. July 3, 1944.
- M2** Amphibious trailers. (n.a.) OEMsr-154; Sparkman and Stephens Job No. 439. Sparkman and Stephens, Inc. July 5, 1944.
- M3** Tractor trailer amphibians. (n.a.) OEMsr-154; Sparkman and Stephens Job No. 449. Sparkman and Stephens, Inc. July 5, 1944.
- M4** Half-track and special feature amphibians. Pelican studies, continued. (n.a.) OEMsr-154; Sparkman and Stephens Job No. 450. Sparkman and Stephens, Inc. July 11, 1944.
- M5** The 15-ton, 3/4-track, amphibious cargo carrier. [Lawrence G. Hecker.] [OEMsr-154.] Sparkman and Stephens Job No. 513. Sparkman and Stephens, Inc. [December 30, 1944.]
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- M2 Pontons for vehicle flotation. (n.a.) OEMsr-154; Sparkman and Stephens Job No. 479. Sparkman and Stephens, Inc. July 4, 1944.
- M3 Ritchie project [devices]. Tank flotation. [Lawrence G. Hecker.] OEMsr-154; Sparkman and Stephens Job No. 497. Sparkman and Stephens, Inc. [December 30, 1944.]
- M4 Special trailer hitch. Olin J. Stephens, II. OEMsr-154; Sparkman and Stephens Job No. 579. Sparkman and Stephens, Inc. June 28, 1945.
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- M2 Letter to Palmer C. Putnam. Subject: Proposed booster-propelled landing boat. Olin J. Stephens, II. [OEMsr-154;] Sparkman and Stephens Job No. 572. Sparkman and Stephens, Inc. January 2, 1945.
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- M1 Reactions of ponton bridges, with and without articulation. H. L. Bowman. OEMsr-41. Drexel Institute of Technology. June 15, 1945.

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- M2 The Inglis bridge. H. L. Bowman. Drexel Institute of Technology. March 31, 1941.
- M3 Temporary highway trestles. Hartley Rowe. April 16, 1941.
- M4 The 90-ton ponton ferry. Design consideration and engineering preliminaries. T. Rees Tarn. May, 1941.
- M5 General description of floating equipment for carrying tanks across water. (n.a.) Sparkman and Stephens Job No. 401. Sparkman and Stephens, Inc. May 19, 1941.
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- M8 [Available materials, loads, stresses and clearances in connection with the design of portable bridges and overpasses.] William F. Carson. NDCrc-41. Carson and Carson. September 22, 1941.
- M9 Letter to Captain F. S. Besson, Jr. Subject: Portable bridges designed by Bethlehem Steel Company. H. L. Bowman. Drexel Institute of Technology. December 19, 1941.

- M10 Letter to Lieutenant Colonel W. C. Baker, Jr. Subject: Possible use as a railway bridge of the H-20 highway bridge. H. L. Bowman. Drexel Institute of Technology. May 11, 1942.
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- M12 Tube bridge. H. L. Bowman. Drexel Institute of Technology. July 28, 1942.
- M13 [Trestle for 60-ton tanks, with railroad loads calculations, pipe structure, landing pier and knock-down truss.] William F. Carson. OEMsr-216. Carson and Carson. December 31, 1942.
- M14 Design of solid floor treadway bridge. [Design prepared by Carson and Carson.] H. L. Bowman. OEMsr-216. Drexel Institute of Technology. April 19, 1943.
- M15 Landing pier. [Design prepared by Carson and Carson.] H. L. Bowman. OEMsr-216. Drexel Institute of Technology. April 27, 1943.
- M16 Quay repairs. H. L. Bowman. OEMsr-41 and OEMsr-216. Drexel Institute of Technology. June 24, 1943.
- M17 Tank ferrying barge and transport vessel. (Sparkman and Stephens Design No. 401, completed May, 1941.) Lawrence G. Hecker. Sparkman and Stephens, Inc. July 20, 1943.
- M18 Articulated bridge for 20-ton loads. H. L. Bowman. Drexel Institute of Technology. October 22, 1943.
- M19 [Ponton bridge using 2½-ton amphibious trucks. Fifteen-foot treadway with wood floor. Quay repairs. Articulated bridge, 20-ton capacity, on tube float. Aluminum alloys.] William F. Carson. NDrc-41 and OEMsr-216. Carson and Carson. December 31, 1943.
- M20 Ramp for solid floor treadway bridge. [Design prepared by Carson and Carson.] H. L. Bowman. OEMsr-41 and OEMsr-216. Drexel Institute of Technology. January 31, 1944.
- M21 Ramp for Sparkman and Stephens Army bridge. H. L. Bowman. OEMsr-41. Drexel Institute of Technology. June 19, 1944.

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- M1 Tests on Douglas fir balk for ponton bridges. H. L. Bowman. OEMsr-41. Drexel Institute of Technology. [February, 1942.]

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- M1 Tests of hollow metal balk. H. L. Bowman. OEMsr-41. Drexel Institute of Technology. July 16, 1942.
- M2 Test of aluminum balk. H. L. Bowman. OEMsr-41. Drexel Institute of Technology. July 15, 1944.
- M3 Test of welded specimens of aluminum alloy, R303-T315. H. L. Bowman. Drexel Institute of Technology. August 6, 1944.
- M4 Deflection test of beam without and with web holes. H. L. Bowman. OEMsr-41. Drexel Institute of Technology. October 31, 1944.
- M5 Used 8-inch aluminum balk, 61S-T. L. P. Mains.

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M6 Test of heavy aluminum balk, 61S-T. L. P. Mains. OEMsr-41. Drexel Institute of Technology. November 22, 1944.

M7 Test of normal aluminum balk, 61S-T, with internal rib. L. P. Mains. OEMsr-41. Drexel Institute of Technology. December 5, 1944.

M8 Tests of heavy 9-inch x 9-inch aluminum balk of alloy, 61S-T. L. P. Mains. OEMsr-41. Drexel Institute of Technology. December 18, 1944.

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M10 Test of aluminum balk, 24S-T, with internal rib. L. P. Mains. OEMsr-41. Drexel Institute of Technology. January 13, 1945.

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M2 Tests on cast-steel balk fasteners for 25-ton ponton bridge. H. L. Bowman. OEMsr-41. Drexel Institute of Technology. March 17, 1943.

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M2 Torpedo net defense for merchant ships. Historical record. (n.a.) [March 19, 1945.]

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M1 [Antitorpedo nets for ships.] TND. Gordon H. Bannerman. OEMsr-1077; Project No. 1-1943. American Steel and Wire Company. [October 15, 1943.]

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M2 The strain energy absorbed by an antitorpedo harbor defense net. (AMP Memorandum No. 67.2.) Herbert J. Greenberg and W. Prager. [OEMsr-1066.] AMG-Brown. October 25, 1943.

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M4 [Torpedo net defense.] Gordon H. Bannerman. OEMsr-1077; Project No. 3-1943. American Steel and Wire Company. June 30, 1944.

M5 [Torpedo net defense.] Gordon H. Bannerman. OEMsr-1077; Project No. 4-1944. American Steel and Wire Company. [September 25, 1944.]

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M2 SIC pistol. Rodney F. Simons. OSRD, London Mission. February 17, 1944.

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M2 Wheeled vehicle development. [Roger S. Warner, Jr.] July 4, 1942.

M3 Turtle. Tentative organization. Roger S. Warner, Jr. July 30, 1942.

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M2 Description of proposed experimental chassis and some adaptations for proposed combat vehicle. (Engineering Report No. 52.) James G. Baker. Baker Manufacturing Company. June 19, 1942.

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- M6** A study of methods of minimizing the effects of recoil in a light gun-carrying vehicle. (Engineering Report No. 63.) Arthur I. Chalfant. Baker Manufacturing Company. November 5, 1942.
- M7** An investigation of jumping as a means of negotiating obstacles. (Engineering Report No. 68.) Arthur I. Chalfant. Baker Manufacturing Company. February 15, 1943.
- M8** Accumulator bladder protecting device. (Engineering Report No. 70.) James G. Baker. Baker Manufacturing Company. March 8, 1943.
- M9** The effect of the recoil of a 75-mm gun on an eight-ton vehicle. (Engineering Report No. 72.) Arthur I. Chalfant. Baker Manufacturing Company. March 10, 1943.
- M10** The hydraulic system of the one-wheel test. (Engineering Report No. 80.) Arthur I. Chalfant. Baker Manufacturing Company. October 20, 1943.
- M11** A combat vehicle of high mobility designed for transportation by air. (Engineering Report No. 96.) James G. Baker. OEMsr-524. Baker Manufacturing Company. June 20, 1944.
- M12** Comparison between British vehicle and vehicle proposed under Contract No. OEMsr-524. [James G. Baker,] OEMsr-524. [Baker Manufacturing Company,] [August 30, 1944.]
- M13** One-wheel performance test of a proposed combat vehicle. (Engineering Report No. 97.) Arthur I. Chalfant. Baker Manufacturing Company. September 5, 1944.
- M14** An evaluation of three special combat vehicles for attack and defense. (Engineering Report No. 64.) Marlin S. Baker. Baker Manufacturing Company. (n.d.)

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- M2** [Gun turret design for light and medium tanks,] Clifford Roberts. NDCrc-204 and OEMsr-112. United Shoe Machinery Corporation. June 30, 1942.
- M3** The design and testing of a centrifugal air cleaner. H. S. Barnaby. OEMsr-133. Sharples Corporation. July 29, 1942.
- M4** Completion of the design and testing of a centrifugal air cleaner. H. S. Barnaby. OEMsr-133. Sharples Corporation. February 8, 1943.
- M5** DUKW tests with barrage rockets. L. A. Richards. California Institute of Technology. February 25, 1943.
- M6** Photographs. Subject: Launchers for DUKW. (n.a.) General Motors Corporation. June 28, 1943.

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- M2** Reduction of the noise from the engine compartment of an M-3 light tank. (Report No. PG-2.232.) Paul Huber. General Motors Corporation. August 15, 1941.
- M3** Muffler study on M-3 light tank. (Report No. PG-2.272.) Paul Huber. General Motors Corporation. October 27, 1941.
- M4** Noise tests on Mark III, Valentine tank. (Report No. PG-2.285.) Paul Huber. General Motors Corporation. November 21, 1941.
- M5** [Tank track noise,] (Progress Report No. PG-2.291.) Paul Huber. Service Project No. OD-19. General Motors Corporation. November 28, 1941.
- M6** Goodrich band track on White half-track. (Report No. PG-2.290.) Paul Huber. General Motors Corporation. November 28, 1941.
- M7** Analysis of mufflers on tanks as related to tactics. (Report No. PG-2.303.) Paul Huber. General Motors Corporation. December 19, 1941.
- M8** Tactical value of tank noise reduction. (Report No. PG-2.304.) Paul Huber. General Motors Corporation. December 22, 1941.
- M9** Recommendations on quieting tanks. (Report No. PG-2.330.) Paul Huber. General Motors Corporation. March 17, 1942.
- M10** Summary of noise investigation on M-3 light tank No. 909. (Report No. PG-2.336.) Paul Huber. General Motors Corporation. April 4, 1942.
- M11** Noise in the crew compartment of M-3 light tank No. 6305. (Report No. PG-2.337.) Frank W. Hayward. General Motors Corporation. April 29, 1942.
- M12** Supplementary muffler report. (Report No. PG-2.305.) Richard O. Painter. General Motors Corporation. April 29, 1942.
- M13** Sprocket noise investigation on M-3 light tank No. 6305, Serial No. 909. (Report No. PG-2.343.) Frank W. Hayward. General Motors Corporation. May 4, 1942.
- M14** Approach noise tests on M-3 light tank No. 6305, Serial No. 909. (Report No. PG-2.338.) Frank W. Hayward. General Motors Corporation. May 14, 1942.
- M15** Track noise and vibration tests on M-3 light tank No. 6305, Serial No. 909. (Report No. PG-2.356.) Frank W. Hayward. General Motors Corporation. May 16, 1942.
- M16** Theory and design of rectangular sound-absorbing ducts. (Report No. PG-2.371.) Martin Hebert, Jr. General Motors Corporation. June 17, 1942.

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- M1** Behavior during towing of, and suggested design changes for two- and four-wheel gun carriages. (Engineering Report No. 57.) James G. Baker. Baker Manufacturing Company. August 7, 1942.

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- M2** Report of Aircraft Brake Survey Committee. C. E. Stryker. Society of Automotive Engineers, Inc. [May 20, 1941.]
- M3** Aircraft brakes [bibliography]. (n.a.) Society of Automotive Engineers, Inc. May 20, 1941.
- M4** Report of Aircraft Brake Survey Committee. C. E. Stryker. Society of Automotive Engineers, Inc. June 10, 1941.
- M5** Aircraft Brakes Survey. Memorandum of interviews. Herbert B. Lewis. National Research Council, Division of Engineering and Industrial Research. August 7, 1941.
- M6** Aircraft brakes. (Progress Reports [covering the period] September, 1941 to February, 1943.) Herbert B. Lewis. National Research Council, Division of Engineering and Industrial Research.
- M7** Meeting on aircraft brake materials, Dayton, Ohio. Herbert B. Lewis. National Research Council, Division of Engineering and Industrial Research. November 11, 1941.
- M8** Conference on heat generation and transfer in aircraft brakes, Cleveland, Ohio. Herbert B. Lewis. National Research Council, Division of Engineering and Industrial Research. June 24, 1942.
- M9** Aircraft brakes. (Final report.) W. F. Durand and W. H. Kenerson. National Research Council, Division of Engineering and Industrial Research. May 1, 1943.

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- M2** Investigation and redesign of Mark 51, Model 7 bomb rack. (Final Report No. ES-6688.) C. E. Osgood. OEMsr-1435. Douglas Aircraft Company, Inc. November 24, 1944.
- M3** Bomb rack Mark 54, Model O. (n.a.) OEMsr-1333. ITE Circuit Breaker Company. December 20, 1944.

1830 Automatic Thread Gauges

- M1** Screw threads. A bibliography of available material on screw thread theory, standards, production methods and gauging methods. (n.a.) OEMsr-497. Jones and Lamson Machine Company and Bryant Chucking Grinder Company. July, 1942.
- M2** Thread gauge manufacture. A monograph on manufacturing methods for the production of plug and ring thread gauges. Douglass Hawks, Jr. OEMsr-497; Service Project No. OD-49. Jones and Lamson Machine Company. April, 1943.
- M3** Thread gauge development. Paul A. Grobety.

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- M1** Pneumatic tire substitutes. S. Murray Jones. [October, 1942.]
- M2** Operating characteristics of the Martin resilient wheel spoke. (Report No. 40.) J. C. Little and R. H. Neill. American Steel and Wire Company. October 22, 1943.
- M3** Operating characteristics of the Martin resilient wheel spoke. (Report No. 40-A.) J. C. Little and R. H. Neill. American Steel and Wire Company. November 29, 1943.
- M4** Development and performance of three types of non-pneumatic lightweight resilient tires. E. E. Sayre. Martin Aeroplane Development Laboratory, Inc. February 1, 1944.
- M5** Pneumatic tire substitutes. S. Murray Jones. Service Project No. OD-96. October, 1944.

1850 Pneumatic Life Raft

- M1** Experimental seven-man pneumatic life raft, No. 1. S. Murray Jones and Harold M. Simmons. Service Project No. NE-102. Sparkman and Stephens, Inc. [April, 1944.]
- M2** Airborne life boat. Harold M. Simmons. Service Project No. NE-101. Sparkman and Stephens, Inc. April 28, 1944.

1860 Antirain and Antifog Compounds

- M1** Fogging of vision devices under flight conditions. (n.a.) OEMsr-436. National Research Corporation. [August 17, 1942.]
- M2** Air conditioning as a means of eliminating fog and frost formation on glass surfaces in optical instruments. (n.a.) OEMsr-436. National Research Corporation. October 8, 1942.
- M3** Rain-repellent coatings as an aid to visibility through vision devices. (n.a.) OEMsr-436. National Research Corporation. [1943.]
- M4** [Fogging of vision surfaces. The rain problem and the icing problem on windshield surfaces.] (n.a.) OEMsr-436. National Research Corporation. [1943.]
- M5** [Vision surfaces under conditions of rain and icing.] The prevention of frost formation. (Progress Report No. 392, for January, 1943.) F. C. Benner. OEMsr-436. National Research Corporation. February 4, 1943.
- M6** [Easily applied rain-repellent coatings.] A study of liquids for use as non-inflammable de-icing fluids, and studies on the formation and prevention of frost on vision surfaces. (Progress Report for February and March, 1943.) (n.a.) OEMsr-436. National Research Corporation. [April, 1943.]
- M7** [Rain-repellent coatings for vision devices.] Testing procedures for the evaluation of rain-repellent coatings. (Progress Report for April and May, 1943.) (n.a.) OEMsr-436. National Research Corporation. [June, 1943.]

- M8** Flight tests of antifogging compounds. R. W. DeMoss and J. M. Kirchberg. US Navy, Air Station, Patuxent River, Maryland. July 20, 1944.

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- M1** Sine-disc propeller investigation. Douglas Van Patten. OEMsr-1188. F. L. Jacobs Company. November 9, 1944.
- M2** Sine-disc propeller work. Olin J. Stephens, II. OEMsr-154; Sparkman and Stephens Job No. 467. Sparkman and Stephens, Inc. June 30, 1945.

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- M2** Model experiments on the effect of relative propeller speeds upon turning of high-speed twin-screw ships. (Technical Memorandum No. 63.) John B. Drisko and Anthony Suarez. Stevens Institute of Technology. July 22, 1942.
- M3** The effect of bilge keels on turning of a destroyer model having twin rudders. (Technical Memorandum No. 65.) John B. Drisko. Section No. C7-sr458-534. Stevens Institute of Technology. October 21, 1942.
- M4** The No. 2 tank for maneuvering tests. (Technical Memorandum No. 64.) Kenneth S. M. Davidson and John B. Drisko. OEMsr-458; Section No. C7-sr458-440; OSRD No. 1039. Stevens Institute of Technology. November 6, 1942.
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- M9** Effect of rudder size on the turning of a destroyer model with twin rudders. (Report No. 241.) John B. Drisko. OEMsr-458; Section No. 12-sr458-446. Stevens Institute of Technology. April 24, 1943.
- M10** The influence of afterbody profile and section shape upon the turning of destroyer models. (Report No. 243.) John B. Drisko. OEMsr-458; Section No. 12-sr458-447. Stevens Institute of Technology. May 29, 1943.
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- M13** Minimum turning circles and steering relating principally to naval vessels of generally conventional types. Summary for turning and steering discussion. Kenneth S. M. Davidson. Stevens Institute of Technology. March 1, 1944.
- M14** Further notes on turning and steering. (Note No. 8. A continuation of N-7, dated March 1, 1944.) Kenneth S. M. Davidson. Stevens Institute of Technology. March 13, 1944.
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- M20** Exploratory investigation of static steering stability and initial turning moment on ship models. (Report No. 270.) William H. Sutherland. OEMsr-458; Section No. [12-]sr458-455. Stevens Institute of Technology. November, 1944.
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- M1** Measurements of snow properties in August, 1942, and a few applications of them, September 16, 1942. Herman Mark. Polytechnic Institute of Brooklyn. September, 1942.
- M2** The investigation of snow properties during October, 1942 on the Columbia Ice Fields. (n.a.) Polytechnic Institute of Brooklyn. October 28, 1942.
- M3** Coordinated snow and weather observations carried out at various locations from January to May, 1943. Herman Mark. Polytechnic Institute of Brooklyn. June, 1943.

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- M2** Wake visibility and its suppression. George L. Clarke. OEMsr-870. General Motors Corporation, GMC Truck and Coach Division. March, 1943.
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- M1** The measurements of wind velocity and wave characteristics [at] Cape Cod, November 10 to December 7, 1942. Herman Mark. Polytechnic Institute of Brooklyn. December 12, 1942.

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- M1** Studies on the gas bubble resulting from underwater explosions. [Studies] on the best location of a mine near the sea bed. (AMP Report No. 37.1R.) Richard Courant. OEMsr-945. AMG-New York University. May, 1944.
- M2** . . . A project to sink the Japanese fleet and to destroy Japanese industry. Palmer C. Putnam, J. H. Sole and F. C. Collbohm. June, 1944.
- M3** Effectiveness of near-miss bombs against warships. E. Bright Wilson, Jr. Project No. 223. Woods Hole Oceanographic Institution. June 23, 1944.
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- M1** Survey of airborne direction finders. John L. Allison. Service Project No. AN-22; OSRD No. 5038. Revised: February 15, 1945.
- M2** Final reports on Contract OEMsr-1441. (Part III.) OEMsr-1441; OSRD No. 6280. Harvard University. December 1, 1945. Contains: Problem No. 1: Tests on direction finder systems. Harry Rowe Mimno. Service Project No. AN-30. Problem No. 2: Study of frequency modulation vs amplitude modulation for use in airborne very high frequency communication equipment. Alexander H. Wing, Jr. Service Project No. AC-230.03. Problem No. 4: Investigation of principles underlying the maximizing of communication intelligibility. W. J. Cunningham. Service Project Nos. NS-365 and NS-108. Problem No. 6: Aircraft transmitter antenna power, impedance and tuning network survey. E. C. Easton, Robert E. Kirkland and S. E. Parker. Service Project No. AC-238.07. Problem No. 8: Measurements of magnetic properties of ferrite core materials. R. Orin Cornett. Problem No. 10: Disguised antenna for very high frequency, ultra high frequency and super high frequency communication equipment. R. P. Lett and K. S. Kunz. Service Project No. SC-142.

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- M1** High frequency direction finder research. [K. G. Jansky,] NDCrc-155; Research Project No. C-16; OSRD No. 209. Bell Telephone Laboratories, Inc. November, 1941.
- M2** High frequency direction finder research. K. G. Jansky. NDCrc-155; Research Project No. C-16; OSRD No. 699. Bell Telephone Laboratories, Inc. June 1, 1942.
- M3** High frequency direction finder apparatus research. (Final Report for [the] period from 1941 to 1942.) Harry M. Diamond, Harold Lifschutz and LaVerne M. Poast. Research Project No. C-18. National Bureau of Standards. July 1, 1942.
- M4** Facilities for direction finder research. J. H. Dellinger, LaVerne M. Poast and S. E. Reymer. Research Project No. C-81. National Bureau of Standards. September 30, 1943.
- M5** Direction finding by improvised means. A. J. Aikens and A. G. Chapman. OEMsr-1410; OSRD No. 4608. Bell Telephone Laboratories, Inc. and Western Electric Company, Inc. November 30, 1944.
- M6** Miscellaneous current direction finding problems. Investigation of compensation in direction finders. Trevor H. Clark and N. Marchand. OEMsr-1490; Service Project No. SC-7; OSRD No. 6657. Federal Telephone and Radio Corporation. September 30, 1945.

101.1 Radio Pulse Propagation

- M1** Study of radio pulse propagation. K. G. Jansky. OEMsr-310; OSRD No. 599. Bell Telephone Laboratories, Inc. and Western Electric Company, Inc. May 1, 1942.

101.2 Polarization Error Studies

- M1** Wave collectors for semi-portable radio direction finders for high frequencies. D. G. C. Luck. NDCrc-149; Research Project No. C-17; OSRD No. 337. RCA Manufacturing Company, Inc. January 21, 1942.
- M2** Investigation of compensation in direction finders. Joseph M. Pettit. NDCrc-159; OSRD No. 508. Stanford University. April 7, 1942.
- M3** Further studies of errors in high frequency direction finders. D. G. C. Luck. OEMsr-338; Research Project No. C-38; OSRD No. 908. RCA Manufacturing Company, Inc. August 25, 1942.
- M4** [Station] WWV transmission observed at Federal Telephone and Radio Laboratories at Great River, L. I. Bearing, polarization [and] ratio of vertical to horizontal field strength. H. Busignies and A. G. Everhart. OEMsr-745; Research Project No. C-58. Federal Telephone and Radio Corporation. January 5, 1943.
- M5** Wave interference errors in direction finders. H. Busignies. OEMsr-745; Research Project No. C-58. Federal Telephone and Radio Corporation. March 8, 1943.
- M6** The measurement of errors of radio direction finders. D. G. C. Luck and L. E. Norton. OEMsr-838; Research Project No. C-78; OSRD No. 1884. Radio Corporation of America. June 10, 1943.
- M7** Study of direction finder fundamentals. H. Busignies and D. Baker. OEMsr-745; Research Project No. C-58; OSRD No. 6608. Federal Telecommunication Laboratories, Inc. December 17, 1945.

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- M1** Influence of ground conductivity on accuracy of NLS-505 direction finder. Trevor H. Clark. OEMsr-1026; OSRD No. 1936. Federal Telephone and Radio Corporation. June 15, 1943.
- M2** Polarization errors of shielded-U Adcock direction finders. D. G. C. Luck and L. E. Norton. OEMsr-838; Research Project No. C-57; OSRD No. 1653. Radio Corporation of America. July 20, 1943.
- M3** Improvement of Band 4 of NLS-505 direction finder. Trevor H. Clark and Henry B. Scarborough. OEMsr-1026; OSRD No. 3318. Federal Telephone and Radio Corporation. [December, 1943.]
- M4** Investigation of site characteristics which lead to errors in direction finders. Trevor H. Clark and Henry B. Scarborough. OEMsr-1026; OSRD No.

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- M1** Coordinated study of ionospheric transmission and direction errors at high radio frequencies. T. R. Gilliland. Research Project No. C-13. National Bureau of Standards. April 26, 1943.
- M2** Direction finder measurements research. G. W. Kenrick. OEMsr-1101; OSRD No. 4528. University of Puerto Rico. June, 1944.
- M3** Correlation of direction finder errors with ionospheric measurements. Harry Rowe Mimno. OEMsr-1252; OSRD No. 3981. Harvard University. July 15, 1944.
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- M5** Coordinated study of correlation of high frequency direction finder errors with ionosphere conditions. LaVerne M. Poast. National Bureau of Standards. August 31, 1944.
- M6** Correlation of direction finder errors with ionospheric conditions at College, Alaska, August 16, 1943 to June 30, 1944. H. W. Wells, S. L. Seaton and E. H. Bramhall. OEMsr-1151; OSRD No. 4225. Carnegie Institution of Washington. September 8, 1944.

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- M3** Electrical direction finder evaluator. John L. Allison, John H. Lewis and H. C. Fryer. OEMsr-1472; Service Project No. SC-130; OSRD No. 6551. J. A. Maurer, Inc. October 31, 1945.

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- M1** Locating tanks by radio. C. W. Harrison. OEMsr-787; Project Nos. SC-31 and C-60; OSRD No. 963. Bell Telephone Laboratories, Inc. and Western Electric Company, Inc. October 15, 1942.
- M2** Locating tanks by radio. C. G. Fick. OEMsr-737; Research Project No. C-61; OSRD No. 1542. General Electric Company. June 4, 1943.

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- M2** Ultra high frequency direction finding study. E. D. Blodgett and L. L. Lakatos. OEMsr-1009; OSRD No. 4285. Radio Corporation of America. July 29, 1944.

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- M3** Ultra high frequency friendly aircraft locator. Section II, Direction finder installation, operating procedure and maintenance instructions. (Report No. 1264-W.) G. C. Larson. [NDCrc-193.] Hazeltine Service Corporation. December 2, 1941.
- M4** Ultra high frequency friendly aircraft locator. Section III, The antenna and transmission line system. (Report No. 1264-W.) G. C. Larson. [NDCrc-193.] Hazeltine Service Corporation. December 2, 1941.
- M5** Ultra high frequency friendly aircraft locator. Section IV, The receiver. (Report No. 1264-W.) Harold L. Blaisdell and G. C. Larson. [NDCrc-193.] Hazeltine Service Corporation. December 2, 1941.
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- M9** Instruction book, ultra high frequency friendly aircraft locator. (Parts I and II. Report No. 1429-W.) (n.a.) NDCrc-193; Service Project No. SCr-552. Hazeltine Service Corporation. December 2, 1942.

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- M2** A study of sferics and weather information. (Terminal Report No. UNM/SC-5.) R. E. Holzer. OEMsr-1485; OSRD No. 6442. University of New Mexico. November 30, 1945.

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- 1396; OSRD No. 4794. Radio Corporation of America. December 2, 1944.
- M2** Study of improvised very high frequency antennas. H. W. Nylund and R. W. Grigg. OEMsr-1411; OSRD No. 4604. Bell Telephone Laboratories, Inc. and Western Electric Company, Inc. December 30, 1944.
- M3** Ultra high frequency direction finding antenna study, 140 mc to 600 mc. (Technical Memorandum No. 122.) Trevor H. Clark and E. Daubaras. OEMsr-961; OSRD No. 5103. Federal Telephone and Radio Corporation. April 15, 1945.
- M4** A study of problems arising from closely grouped antennas. R. W. Grigg and W. R. Young. OEMsr-1412; OSRD No. 5503. Bell Telephone Laboratories, Inc. and Western Electric Company, Inc. August 1, 1945.
- M5** Final reports on Contract OEMsr-1441. (Part IV.) OEMsr-1441; OSRD No. 6422. Harvard University. December 1, 1945. Contains: Problem No. 5: Developments of faired-in antennas for naval aircraft. K. S. Kunz, H. Faulkner and others. Service Project No. NA-212. Problem No. 7: Aircraft antennas. Location of slot-type AN/APN-1 altimeter antennas on naval aircraft. B. C. Dunn, W. D. Woo and Ronold W. P. King. Service Project No. NA-236.
- 104.1 Antenna Patterns for Aircraft**
- M1** Antenna patterns for aircraft. George Sinclair. NDCrc-100; Service Project No. SC-17; OSRD No. 886. Ohio State University. August 31, 1942.
- M2** [The] C-11 antenna patterns for aircraft. George Sinclair. NDCrc-100; Service Project No. SC-17. Ohio State University. August 24, 1943.
- 200 GENERAL COMMUNICATION RESEARCH**
- M1** General research in field of communication. M. L. Almquist. OEMsr-1413; OSRD No. 5741. Bell Telephone Laboratories, Inc. August 31, 1945.
- M2** Summarizing report on the affairs of the Interference Reduction Committee. K. C. Black. November 27, 1945.
- 200.1 Systems Research for US Army Air Forces**
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- M2** Systems engineering for Army Air Forces communications. (Part II.) (n.a.) OEMsr-1018; Service Project No. AC-54; OSRD No. 1925. Bell Telephone Laboratories, Inc. October 1, 1943.
- M3** Systems engineering for Army Air Forces communications. (Part III.) (n.a.) OEMsr-1018; Service Project No. AC-54; OSRD No. 4293. Bell Telephone Laboratories, Inc. August 30, 1944.
- 200.2 Propagation Studies**
- M1** Radio transmission handbook, frequencies 1000 to 30,000 kc. (n.a.) OSRD No. 385. National Bureau of Standards. January 1, 1942.
- M2** Supplement to radio transmission handbook, Summer, 1942. [J. H. Dellinger and C. O. Marsh.] OSRD No. 666. National Bureau of Standards. June 1, 1942.
- M3** Radiotelephone communication between mobile units. Stuart L. Bailey. OEMsr-174; OSRD No. 1618. Jansky and Bailey. June, 1943.
- M4** Effect of hills and trees as obstructions to radio propagation. Delmer C. Ports. OEMsr-1010; Service Project No. AC-54; OSRD No. 3070. Jansky and Bailey. November, 1943.
- M5** Charts for use in field intensity computations. (Report No. 3460-KB-NF.) K. Bullington. OEMsr-1018; Service Project No. AC-54. Bell Telephone Laboratories, Inc. November 2, 1943.
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- 200.4 Navigation Systems**
- M1** Electronic navigation systems. (Part II, Final report.) (n.a.) OEMsr-1441; Service Project No. AN-31; OSRD No. 6279. Harvard University. December 1, 1945.
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- 201.1 Equipment**
- M1** A klystron transmitter for 3000-megacycle operation. (n.a.) NDCrc-191; OSRD No. 210. Westinghouse Electric Company, Inc. November 11, 1941.
- M2** 3000-mc receivers. R. S. Holmes. NDCrc-75; Service Project No. SC-13; OSRD No. 482. Radio Corporation of America. February 19, 1942.
- 201.2 Radio Frequency Generators**
- M1** Radio frequency generator, 2000 to 3000 mc. R. K. Potter. NDCrc-177; OSRD No. 205. Bell Telephone Laboratories, Inc. October 1, 1941.
- 202 Precipitation Static Problems**
- 202.1 Precipitation Static Reduction Research**
- M1** Precipitation static reduction research. (Report for the period June 15, 1941 to March 31, 1943.) W. H. Huggins. OEMsr-92; Service Project No. SC-2; OSRD No. 1907. Oregon State College. March 31, 1943.
- M2** Note on Interference Reduction Committee for

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Lawrence W. Baldwin. April 15, 1946.

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- M1** Precipitation static research. Sheldon H. Dike. OEMsr-678; Service Project No. SC-2; OSRD No. 1411. University of New Mexico. May 1, 1943.
- M2** Study of the effect of aircraft surface treatment on electrical charges causing precipitation static. Roscoe H. George. OEMsr-679; Service Project No. SC-2; OSRD No. 1446. Purdue University. May 11, 1943.
- M3** Precipitation static research. E. P. Buckthal and K. M. Cummings. OEMsr-893; Service Project No. SC-2; OSRD No. 1807. United Air Lines Transport Corporation. August 31, 1943.
- M4** Precipitation static reduction research. (Report for the period November 1, 1942 to February 15, 1944.) Homer J. Dana. OEMsr-848; Service Project No. SC-2; OSRD No. 3595. Washington State College. March 20, 1944.

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- M1** Investigation of engine noise problems. D. F. Seacord. OEMsr-1018; Service Project No. AC-54. Bell Telephone Laboratories, Inc. October 15, 1943.
- M2** Investigations of the measurement of noise. W. J. Bartik, T. H. Bonn and others. OEMsr-1478; Service Project No. NS-368; OSRD No. 6358. University of Pennsylvania. October 31, 1945.
- M3** Investigation of radio noise generation in aircraft electrical machinery. (Report covering period from May 16, 1945 to October 31, 1945.) C. W. Frick. OEMsr-1475; Service Project No. AC-238.03; OSRD No. 6631. General Electric Company. January 20, 1946.

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203.1 Fundamentals

- M1** The fundamentals of panoramic reception. Estill I. Green. OEMsr-357; OSRD No. 1224. Bell Telephone Laboratories, Inc. January 20, 1943.

203.2 Panoramic Receiver with Moving Screen Indicator

- M1** Panoramic receiver with moving screen indicator. (n.a.) OEMsr-49; OSRD No. 396. Bell Telephone Laboratories, Inc. February 19, 1942.

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- M2** Improved panoramic receiver. (Part II.) E. R. Taylor. OEMsr-357; Research Project No. C-36; OSRD No. 909. Bell Telephone Laboratories, Inc. January 22, 1943.

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- M1** Developmental model of an interference generator for the 2 to 20-megacycle spectrum. Madison Cawein. OEMsr-89; Service Project No. SC-19. Farnsworth Television and Radio Corporation. May 1, 1942.
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M2 Tentative simplified explanation of the Lawson line. (Special Report No. 142.) (n.a.) MIT, Radiation Laboratory. July 25, 1941.

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- M3** Microwave interference patterns. (Report No. 13.) J. A. Stratton. MIT, Radiation Laboratory. March 7, 1942.
- M4** The atmospheric absorption of microwaves. (Report No. 175.) John H. Van Vleck. MIT, Radiation Laboratory. April 27, 1942.
- M5** Relation of radar range to frequency and polarization. (Report No. 18.) (n.a.) MIT, Radiation Laboratory. November 3, 1942.
- M6** Experiments in microwave breakdown. (Report No. 731.) D. Q. Posin, Ina Mansur and H. Clarke. OEMsr-262. MIT, Radiation Laboratory. November 28, 1945.

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- M2** Double curvature surfaces for beam shaping with point source feeds. (Report No. 691.) Samuel Silver. OEMsr-262. MIT, Radiation Laboratory. June 15, 1945.
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122.121 Ground

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- M2** The absorption of one-half centimeter electromagnetic waves in oxygen. (Report No. 684.) E. R. Beringer. OEMsr-262; Service Project No. AN-25. MIT, Radiation Laboratory. January 26, 1945.
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- M2** The propagation of 10-cm waves over land paths of 14, 52 and 112 miles. (Report No. 202.) Paul A. Anderson and C. L. Barker. OEMsr-728. Washington State College. October 26, 1943.

122.22 Water Surfaces

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- M2** Climate in relation to microwave radar propagation in Panama. (Report No. 476.) Arthur E. Bent. OEMsr-262. MIT, Radiation Laboratory. February 25, 1944.
- M3** Echoes from tropical rain on X-band airborne radar. (Report No. 728.) Arthur E. Bent. OEMsr-262. MIT, Radiation Laboratory. June 15, 1945.
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- M5** Radar echoes from precipitation layers. (Report No. 689.) Arthur E. Bent. OEMsr-262. MIT, Radiation Laboratory. August 20, 1945.
- M6** An aerial investigation of K-band radar performance under tropical atmospheric conditions. (Report No. 729.) R. S. Bender, Arthur E. Bent and J. W. Miller. OEMsr-262; Service Project No. AN-25. MIT, Radiation Laboratory. October 1, 1945.

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- M2** Nomograms for computation of modified index of refraction. (Report No. 551.) Robert H. Burgoyne. OEMsr-262. MIT, Radiation Laboratory. April 6, 1945.
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- M2** Photographic polarization tests. (Report No. 382.) G. A. Garrett and Keith L. Mealey. MIT, Radiation Laboratory. May 7, 1943.
- M3** The depolarization of microwaves. (Report No. 458.) M. Kessler, C. E. Mandeville and Emmett L. Hudspeth. MIT, Radiation Laboratory. November 1, 1943.
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- M2** Pulse doppler with reference to ground speed indication. (Report No. 63.) D. Sayre. MIT, Radiation Laboratory. March 20, 1944.
- M3** Detector cancellation error as a function of carrier frequency. (Report No. 859.) Walter Selove. OEMsr-262. MIT, Radiation Laboratory. October 31, 1945.

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- M1** Pulse length discrimination in beacons. (Report No. 510.) C. L. Longmire. OEMsr-262. MIT, Radiation Laboratory. January 27, 1944.
- M2** [The] effect of pulse length on system performance and operation. (Report No. 571.) R. Rollefson, A. H. Nelson and L. A. Hartman. OEMsr-262; Service Project No. NS-137. MIT, Radiation Laboratory. May 30, 1944.
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- M4** Pulse length selector and multiple pulse decoder. (Report No. 917.) R. M. Ashby and L. K. Neher. OEMsr-262. MIT, Radiation Laboratory. March 21, 1946.

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- M2** The appearance of the A-scope when the pulse travels through a homogeneous distribution of scatterers. (Report No. 466.) A. J. F. Siegert. MIT, Radiation Laboratory. November 9, 1943.
- M3** Pulse shapes and radio frequency spectra for combinations of Stromberg-Carlson Mark I and Mark II modulators with 2J-22, 2J-21 and 725-A magnetrons. (Report No. 518.) G. N. Glasoe. OEMsr-262. MIT, Radiation Laboratory. March 17, 1944.
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- M2** Response of a non-linear device to noise. (Report No. 129.) Norbert Wiener. MIT, Radiation Laboratory. April 6, 1942.
- M3** Kinetic derivation of the thermal noise formula. (Report No. 191.) P. R. Weiss and S. A. Goudsmit. MIT, Radiation Laboratory. January 18, 1943.
- M4** Statistics of circuit noise. (Report No. 192.) [S. A. Goudsmit and P. R. Weiss.] MIT, Radiation Laboratory. January 29, 1943.
- M5** The comparison between signal and noise. (Report No. 193.) S. A. Goudsmit. MIT, Radiation Laboratory. January 29, 1943.
- M6** The theory of noise in conductors, semiconductors and crystal rectifiers. (Report No. 133.) Victor F. Weisskopf. MIT, Radiation Laboratory. May 12, 1943.
- M7** Theory of random processes. (Report No. 454.) G. E. Uhlenbeck. MIT, Radiation Laboratory. October 15, 1943.
- M8** Coherent integration. (Report No. 103.) A. G. Emslie. MIT, Radiation Laboratory. May 16, 1944.
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- M1** Notes on measurement of noise, gain and noise figure of converters. (Report No. 295.) William

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- M2** An automatic noise figure meter. (Report No. 1017.) Walter Selove. OEMsr-262. MIT, Radiation Laboratory. March 26, 1946.

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- M1** Coincidence method of noise reduction. (Report No. 119.) W. W. Hansen. [MIT, Radiation Laboratory.] August 25, 1941.
- M2** Noise reduction by delayed feed-back. (Report No. 146.) T. T. Eaton. OEMsr-252. Radio Corporation of America. April 15, 1943.

130 Development of and Experimentation with Materials

131 Dielectrics

131.1 Dielectric Materials

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- M2** The interaction between electromagnetic fields and dielectric materials. (Report No. 122.) Arthur R. von Hippel and R. G. Breckenridge. OEMsr-191. MIT, Laboratory for Insulation Research. January, 1943.
- M3** Tables of dielectric materials. (Volumes I and II. Report Nos. 237 and 425.) Arthur R. von Hippel. OEMsr-191. MIT, Laboratory for Insulation Research. February, 1944 and June, 1945.
- M4** Development and wide frequency investigation of dielectrics. (Report No. 544.) Arthur R. von Hippel. OEMsr-191. MIT, Laboratory for Insulation Research. October, 1945.

131.11 Ceramics

- M1** High dielectric constant ceramics. (Report No. 300.) Arthur R. von Hippel, R. G. Breckenridge and others. OEMsr-191. MIT, Laboratory for Insulation Research. August, 1944.
- M2** Titania ceramics. ([Part] II. Report No. 540.) Arthur R. von Hippel, R. G. Breckenridge and others. OEMsr-191. MIT, Laboratory for Insulation Research. October, 1945.

131.12 Glass

- M1** Soldering to glass. (Report No. 217.) Stanley A. Johnson. Polytechnic Institute of Brooklyn. December 28, 1942.

131.13 Plastics

- M1** The polystyrene plastics as high-frequency dielectrics. (Report No. 276.) Arthur R. von Hippel, L. G. Wesson and S. L. Whitcher. OEMsr-191. MIT, Laboratory for Insulation Research. May, 1944.
- M2** An apparatus for determining heat distortion characteristics of plastics. (Report No. 542.) Paul F.

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- 131.14 Liquids**
- M1** Dielectric properties of water and ice at K-band. (Report No. 644.) E. L. Younker. OEMsr-262; Service Project No. AN-25. MIT, Radiation Laboratory. December 4, 1944.
- 131.15 Iron**
- M1** The application of powdered iron materials as permeable dielectrics at microwave frequencies. (Report No. 906.) Maurice B. Hall and Margaret Harwood. OEMsr-262. MIT, Radiation Laboratory. March 26, 1946.
- 131.2 Constant and Loss Measurement**
- M1** Auxiliary equipment for the MIT co-ax instrument and its use. (Report No. 210.) Arthur R. von Hippel, D. G. Jelatis and others. OEMsr-191. MIT, Laboratory for Insulation Research. November, 1943.
- M2** Techniques and calculations used in dielectric measurements on shorted lines. (Report No. 490.) W. B. Westphal, L. Muldoon and others. OEMsr-191. MIT, Laboratory for Insulation Research. August, 1945.
- M3** Dielectric constant and loss tangent computation. (Report No. 483-19.) Yael N. Dowker. OEMsr-262. MIT, Radiation Laboratory. August 7, 1945.
- M4** The design of equipment for measurement of dielectric constant and loss with standing waves in wave guides. (Report No. 541.) M. G. Hangen and W. B. Westphal. OEMsr-191. MIT, Laboratory for Insulation Research. October, 1945.
- 131.3 Transmission Properties**
- M1** Transmission through dielectric. (Report No. 113.) L. J. Chu. [MIT, Radiation Laboratory.] December 11, 1940.
- M2** Dielectric transmission measurements. (Report No. 244.) H. A. Leiter. MIT, Radiation Laboratory. January 15, 1943.
- M3** Effect of small crystallites on conductivity. (Report No. 377.) B. Goodman. OEMsr-388. University of Pennsylvania. April 25, 1945.
- 132 Protective Coatings (Absorbent Materials)**
- M1** Surfaces which reflect radio waves poorly. (Report No. 72.) Otto Halpern. MIT, Radiation Laboratory. November 4, 1942.
- M2** Special protective coatings. Monthly summaries. (Report Nos. 211, 241, 247, 254, 264, 273, 280, 291, 306, 325, 358, 378, 389, 403, 422, 426, 448, 452, 464, 491 and 502 [for the] period December 8, 1943 to September 8, 1945.) G. D. Patterson, G. T. Vaala and others. OEMsr-1199; Service Project No. N-173s-5822. E. I. duPont de Nemours and Company, Inc.
- M3** Special protective coatings. ([Parts] I to XXV. Report Nos. 344 to 356, 467, 469, 470, 508 and 547 to 554, for the period December 1, 1943 to September 30, 1945.) G. T. Borchardt, E. D. Bailey and others. OEMsr-1199; Research Project No. 3042. E. I. duPont de Nemours and Company, Inc.
- M4** Special protective coatings. Methods of analysis for aluminum film and its ingredients. (Report No. 357 [for the period] from March 15 to June 24, 1944.) A. H. Hale, R. S. Blake and others. OEMsr-1199. E. I. duPont de Nemours and Company, Inc. [July, 1944.]
- M5** The preparation of Sambo films, Scheme A. (Report No. 343.) (n.a.) OEMsr-1199. E. I. duPont de Nemours and Company, Inc. November 1, 1944.
- M6** Special protective coatings. Physical performance tests on preferred Sambo system under simulated service conditions. (Report No. 395, for period of August 1 to December 15, 1944.) W. A. Hoffman and C. W. Theobald. OEMsr-1199. E. I. duPont de Nemours and Company, Inc. January 6, 1945.
- 200 COMPONENT DEVELOPMENTS**
- 210 General Components**
- M1** [The] 3.3-cm system. (Report No. 24.) N. F. Ramsey, R. M. Alexander and others. MIT, Radiation Laboratory. May 20, 1941.
- M2** Lightweight X-band radar. (Report No. 195, for [the] period of July 1, 1942 to July 1, 1943.) R. S. Holmes. OEMsr-684. Radio Corporation of America. July 1, 1943.
- M3** General lecture series on radar components. (Report No. T-18.) Herbert H. Wheaton. OEMsr-262. MIT, Radiation Laboratory. December 1, 1944.
- 211 Circuit Elements**
- 211.1 Resistors**
- M1** High-frequency characteristics of resistors. (Report No. 520.) Donald T. Drake. OEMsr-262. MIT, Radiation Laboratory. March 9, 1944.
- 211.2 Delay Lines**
- M1** A video delay line. (Report No. 302.) D. F. Weekes. MIT, Radiation Laboratory. April 24, 1943.
- M2** Equalized delay lines. (Report No. 550.) Heinz E. Kallmann. OEMsr-262. MIT, Radiation Laboratory. June 3, 1944.
- M3** A theory of the supersonic delay line. (Report No. 733.) V. W. Hughes. OEMsr-262; Service Project No. SC-73. MIT, Radiation Laboratory. September 15, 1945.
- M4** The theory and performance of liquid delay lines.

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- M5** A method of compensating the frequency dependence of attenuation in a supersonic delay line. (Report No. 965.) Robert D. Arnold. Service Project No. SC-73. MIT, Radiation Laboratory. December 27, 1945.
- M6** Supersonic delay lines. (Report No. 850.) Herbert Shapiro. OEMsr-262. MIT, Radiation Laboratory. March 15, 1946.
- M7** Description and operation of the general purpose variable delay unit. (Report No. 891.) R. P. Abbenhouse. OEMsr-262. MIT, Radiation Laboratory. March 26, 1946.

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- M2** Linearity of standard wire-wound volume-control type potentiometers. (Report No. 313.) Paul Rosenberg. MIT, Radiation Laboratory. February 3, 1943.
- M3** Specification of performance tests for plan position indicator sinusoidal potentiometers, Types RL-10E and RL-14. (Report No. 316.) Paul Rosenberg. MIT, Radiation Laboratory. May 25, 1943.
- M4** Present status of potentiometer projects in the Radiation Laboratory. (Report No. 318.) Paul Rosenberg. MIT, Radiation Laboratory. June 15, 1943.
- M5** Potentiometer, Type RL-B, for azimuth and elevation indication on magnetically deflected cathode-ray tubes. (Report No. 409.) Paul Rosenberg. MIT, Radiation Laboratory. July 15, 1943.
- M6** Sinusoidal potentiometers, Types RL-10CB, RL-10CD, RL-10E and RL-14. (Report No. 423.) Paul Rosenberg. MIT, Radiation Laboratory. August 16, 1943.
- M7** Sinusoidal potentiometers, Types RL-11, RL-15 and RL-204. (Report No. 459.) Paul Rosenberg. MIT, Radiation Laboratory. December 16, 1943.
- M8** Matching resistance curves by means of two linear gauged potentiometers and a three-terminal resistance network. (Report No. 610.) Norman H. Painter. OEMsr-262. MIT, Radiation Laboratory. August 17, 1944.
- M9** Life test of contact material on standard linear wire-wound potentiometers. (Report No. 617.) Fred E. Dole and Robert J. Sullivan. OEMsr-262. MIT, Radiation Laboratory. March 12, 1946.
- M10** Sine potentiometer tester. (Report No. 940.) C. A. Washburn. OEMsr-262. MIT, Radiation Laboratory. March 21, 1946.
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211.4 Transformers

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- M15** Proposed basic specification for pulse transformers. (Report No. 881.) P. Roger Gillette. OEMsr-262. MIT, Radiation Laboratory. November 8, 1945.
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- M2** Transmission of higher harmonics through a transmit-receive cavity. (Report No. 361.) Bruce Cork. MIT, Radiation Laboratory. January 11, 1943.
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- M2** Calculation of pulse forming networks having slow rates of voltage rise. (Report No. 698.) Anna Walter. OEMsr-262. MIT, Radiation Laboratory. March 12, 1945.
- M3** Colloquium on pulse forming networks, October 12, 1944. (Report No. 692.) P. Roger Gillette and Richard Blythe. OEMsr-262. MIT, Radiation Laboratory. March 14, 1945.
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- M2** Hand radar ranging circuit. (Report No. 327.) Britton Chance. MIT, Radiation Laboratory. January 8, 1943.
- M3** Frequency division with blocking oscillator pulse transformers. (Report No. 329.) George Hite, Earl Whitham and Britton Chance. MIT, Radiation Laboratory. March 11, 1943.
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- M2** Analysis of the double-triode integrator. (Report No. 159.) B. Rossi and N. Nereson. OEMsr-768. Cornell University. July 14, 1943.
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- 214.1 Amplidynes**
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- M2** Amplidyne servo for SCR-598 surface fire control set. (Report No. 435.) Carlton W. Miller. MIT, Radiation Laboratory. October 1, 1943.
- M3** Tests on an M-3B1 oil gear and an amplidyne servo for the SCR-598 control problem. (Report No. 464.) H. Tyler Marcy and Carlton W. Miller. OEMsr-262. MIT, Radiation Laboratory. January 4, 1944.
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- M2** Selsyns. (Report No. 12.) (n.a.) MIT, Radiation Laboratory. April 1, 1942.
- M3** Geared selsyns. (Report No. 388.) R. E. Meagher and M. D. McFarlane. MIT, Radiation Laboratory. October 9, 1942.
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- M2** Development of a flexible relay servomechanism and application to sector scanning spinner controls. (Report No. 386.) Edward E. Miller. MIT, Radiation Laboratory. May 29, 1942.
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- M4** Development of series spark gaps. (Report No. 327, for the period of January 1, 1943 to June 30, 1944.) Edward G. F. Arnott. OEMsr-709. Westinghouse Electric and Manufacturing Company, Inc. August 14, 1944.
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- M6** Double-triggering and voltage balancing for series gaps. (Report No. 493.) Harold J. Sullivan. OEMsr-709. Westinghouse Electric and Manufacturing Company, Inc. May 22, 1945.
- M7** Development of series spark gaps. (Report No. 494.) Edward G. F. Arnott. OEMsr-709. Westinghouse Electric and Manufacturing Company, Inc. July 12, 1945.
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- M12** Operation of sintered iron sponge mercury cathode-type series gaps at ship-controlled inter-

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- M14** Modulator for AN/TPS-10 radar. (Report No. 997.) P. C. Bettler. OEMsr-262; Service Project No. AC-239.04. MIT, Radiation Laboratory. January 31, 1946.
- M15** Some characteristics of the 1B-41, 1B-45 and 1B-49 series spark gaps. (Report No. 682-4.) Joseph R. Dillinger. OEMsr-262. MIT, Radiation Laboratory. March 19, 1946.

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- M2** Pulse thyratrons. (Report No. 90, for the period June, 1941 to December, 1941.) Elliott J. Lawton. OEMsr-180. General Electric Company. May 26, 1942.
- M3** Pulse thyratrons. (Report No. 411.) Paul W. Crapuchettes. OEMsr-180. General Electric Company. April 10, 1943.

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- M2** Instruction manual for Model 7-A hydrogen thyatron modulator. (Report No. M-145.) H. J. Hall. OEMsr-262. MIT, Radiation Laboratory. February 1, 1944.
- M3** Model 7 experimental hydrogen thyatron modulator. (Report No. 485.) H. J. Hall. OEMsr-262. MIT, Radiation Laboratory. February 25, 1944.
- M4** Trigger requirements of the 4C-35 and 3C-45 hydrogen thyratrons. (Report No. 605.) S. J. Krulikoski, Jr. OEMsr-262. MIT, Radiation Laboratory. August 31, 1944.
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M9 Summary of the life test program on 3C-45, 4C-35 and 5C-22 hydrogen thyatrons. (Report No. 865.) S. J. Krulikowski, Jr. OEMsr-262. MIT, Radiation Laboratory. January 31, 1946.

M10 Hydrogen thyatrons in pulse generator circuits. (Report No. 953.) S. J. Krulikowski, Jr. OEMsr-262. MIT, Radiation Laboratory. March 18, 1946.

231.23 Rotary Spark Gaps

M1 Rotary spark gap modulators. (Report No. 209.) Harry J. White and Joseph R. Dillinger. MIT, Radiation Laboratory. May 19, 1942.

M2 The time fluctuations of a rotary spark gap modulator. (Report No. 356.) Leon B. Linford, Dudley A. Williams and others. MIT, Radiation Laboratory. December 18, 1942.

M3 Stability of magnetrons operated by spark gap modulators. (Report No. 620.) D. F. Winter and H. A. Miley. OEMsr-262. MIT, Radiation Laboratory. October 9, 1944.

231.3 Radiation Laboratory Model Nos. 4, 6, 9, 12, 17 and 20

M1 Instruction manual for experimental service modulator, Model 4, Type 1372. (Report No. M-111.) (n.a.) MIT, Radiation Laboratory. July 30, 1942.

M2 Instruction manual for service modulator, Model 9. (Report No. M-131.) K. J. Urquhart. MIT, Radiation Laboratory. September 1, 1943.

M3 Instruction manual for Model 6-B, microwave early warning modulator. (Report No. M-139.) P. C. Bettler. MIT, Radiation Laboratory. November 29, 1943.

M4 Instruction manual for Model 6 modulator. (Report No. M-153.) P. C. Bettler. OEMsr-262. MIT, Radiation Laboratory. February 18, 1944.

M5 Model 6 modulator performance tests. (Report No. 549.) P. C. Bettler. OEMsr-262; Service Project Nos. SC-60 and SC-71. MIT, Radiation Laboratory. April 22, 1944.

M6 Operating instructions for Model 12 modulator. (Report No. M-239.) A. C. Donovan. OEMsr-262. MIT, Radiation Laboratory. September 17, 1945.

M7 Instruction manual for Model 20 laboratory modulator. (Report No. M-232.) C. R. Ricker. OEMsr-262. MIT, Radiation Laboratory. February 19, 1946.

M8 Instruction manual for Model 17 laboratory modulator. (Report No. M-187.) C. R. Ricker. OEMsr-262. MIT, Radiation Laboratory. March 1, 1946.

231.4 Miscellaneous Modulators

M1 Pulsers. (Report Nos. 66, 67 and 68.) Elisabeth M. Lyman, M. H. Kanner and others. MIT, Radiation Laboratory. December 2 and 27, 1940 and February 1, 1941.

M2 Test set for Raytheon service modulator. (Report No. 76.) Paul D. Bales. MIT, Radiation Laboratory. November 5, 1941.

M3 Instruction manual for Raytheon service modulator, WX-3587A. (Report No. 78.) H. J. Hall. MIT, Radiation Laboratory. December 18, 1941.

M4 Instruction manual for Raytheon laboratory modulators WX-4054, WX-4054A and WX-4054B. (Report No. M-103.) Sims McGrath. MIT, Radiation Laboratory. April 7, 1942.

M5 An electronic modulator for continuous-wave magnetrons. (Report No. 748.) A. Banos, Jr. and David S. Saxon. OEMsr-262. MIT, Radiation Laboratory. June 26, 1945.

M6 The development of a power output tube for NDRC Microwave Section, Project No. 3. (Report No. 471.) R. B. Ayer. Radio Corporation of America. July 26, 1945.

M7 A radio frequency mechanical modulator for S-band. (Report No. 798.) R. M. Fano. OEMsr-262. MIT, Radiation Laboratory. August 30, 1945.

M8 General theory of electronic beam modulators. (Report No. 758.) David S. Saxon. OEMsr-262. MIT, Radiation Laboratory. March 15, 1946.

231.5 Modulators and Noise Factors

M1 Reduction of radar-radio interference from modulators. (Report No. 431.) L. W. Mallach. MIT, Radiation Laboratory. August 3, 1943.

M2 Reduction of power line noise in modulators. (Report No. 634.) Gershon J. Wheeler. OEMsr-262. MIT, Radiation Laboratory. December 11, 1944.

231.6 Filters

M1 A method of shielding for filter insertion loss measurements. (Report No. 786.) Gershon J. Wheeler. OEMsr-262. MIT, Radiation Laboratory. August 8, 1945.

M2 Electrical and physical characteristics of some commercial feed-through filters. (Report No. 785.) Gershon J. Wheeler. OEMsr-262. MIT, Radiation Laboratory. October 2, 1945.

232 Radio Frequency Sources

M1 Report of the Radio Frequency Section. (Report No. 140.) (n.a.) MIT, Radiation Laboratory. July 7, 1941.

232.1 Magnetrons and Their Design

M1 Note on the design of magnetrons. (Report No. 88.) G. B. Collins. MIT, Radiation Laboratory. February 9, 1942.

M2 Theory of magnetron operation. (Report No. 200.) J. C. Slater. MIT, Radiation Laboratory. March 8, 1943.

M3 Practical considerations of magnetron design. (Report No. 226.) W. V. Smith. MIT, Radiation Laboratory. August 22, 1943.

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- M4** Manual for magnetrons, Types 2J22-34, 706AY-GY, 714AY and 718AY-EY. (Report No. M-116.) Kenneth R. More. MIT, Radiation Laboratory. September 1, 1943.
- M5** Analysis of magnetron performance. Part I, Equivalent circuit, method applications. (Report No. 229.) F. F. Rieke. MIT, Radiation Laboratory. September 16, 1943.
- M6** [Magnetron development.] Columbia Radiation Laboratory progress report. (Report No. 239.) (n.a.) OEMsr-485. Columbia University, Radiation Laboratory. January, 1944.
- M7** Analysis of magnetron operation. Part II, Detailed study of the operation of a magnetron. (Report No. 451.) Robert Platzman, J. E. Evans and F. F. Rieke. OEMsr-262. MIT, Radiation Laboratory. March 3, 1944.
- M8** Magnetrons for production of centimeter wave length radiation. Absorption of such radiation in water vapor. (Report No. 588.) (n.a.) OEMsr-485. Columbia University, Radiation Laboratory. April 1, 1946.

232.11 Centimeter Frequencies

- M1** Development of 1- and 3-cm magnetrons. (Report No. 223.) (n.a.) OEMsr-485. Columbia University, Radiation Laboratory. November 15, 1943.

232.111 One Centimeter (K-Band)

- M1** [The] 1-cm magnetron research [at] Columbia Radiation Laboratory. (Report No. 120.) J. M. B. Kellogg. OEMsr-485. Columbia University, Radiation Laboratory. January 14, 1943.
- M2** K-band work in USA. (Report No. 475.) B. Bleaney. MIT, Radiation Laboratory. October 20, 1943.
- M3** Cold impedance of E-5 tubes. (Report No. 235.) G. Becker and Sidney Millman. OEMsr-485. Columbia University, Radiation Laboratory. January 28, 1944.
- M4** [Tubes.] Columbia Radiation Laboratory progress reports. (Report Nos. 260 and 266.) (n.a.) OEMsr-485. Columbia University, Radiation Laboratory. February and March, 1944.
- M5** [A] K-band magnetron. (Report Nos. 299 and 299-A.) J. H. Findlay and P. R. Kalisher. OEMsr-1165. Westinghouse Electric and Manufacturing Company, Inc. May 22 and August 21, 1944.
- M6** Operations of the Project Tube Shop, Dept. 681 [from] November, 1943 through December, 1944. (Report No. 500.) N. E. Pryslak. OEMsr-477. Radio Corporation of America. December, 1944.
- M7** Wave guide output magnetrons employing fused quartz output transformers. (Report No. 367.) L. Malter and J. L. Moll. OEMsr-1043. Radio Corporation of America. January 15, 1945.
- M8** [A] K-band magnetron. (Report No. 444.) L. Malter. OEMsr-1043. Radio Corporation of America. March 1, 1945.
- M9** [The] 22- to 38-vane rising-sun magnetrons with

large numbers of anode cavities for centimeter and millimeter wave lengths. (Report No. 589.) A. V. Hollenberg, N. Kroll and Sidney Millman. OEMsr-485. Columbia University, Radiation Laboratory. May 10, 1946.

232.112 Three Centimeters (X-Band)

- M1** Characteristics of 3-cm magnetrons and instructions for their operation. (Report No. 87.) G. B. Collins and L. F. Moore. MIT, Radiation Laboratory. December 9, 1941.
- M2** [A] 3-cm magnetron test bench. Construction and operation. (Report No. M-114.) J. B. Wiesner. MIT, Radiation Laboratory. August 22, 1942.
- M3** 3-cm magnetron cold impedance. (Report No. 163.) Dorothy D. Montgomery and C. G. Montgomery. MIT, Radiation Laboratory. September 16, 1942.
- M4** Tubes for lightweight X-band radar and ultra portable X-band beacon. (Report No. 415.) J. S. Donal, Jr. and C. P. Vogel. OEMsr-684. Radio Corporation of America. December 1, 1944.
- M5** Frequency drift of certain X-band magnetrons. (Report No. 663.) Kenneth R. More and W. W. Mathison. OEMsr-262. MIT, Radiation Laboratory. January 23, 1945.
- M6** The BM-50 magnetron. (Final Report No. 1007.) F. Hutchinson, N. P. Nichols and others. OEMsr-262. MIT, Radiation Laboratory. March 29, 1946.

232.113 Nine to Twelve Centimeters (S-Band)

- M1** Transmitting Tube Section. (Report Nos. 79, 80, 81, 82 and 85.) (n.a.) MIT, Radiation Laboratory. December 2 and 17, 1940; January 13, January 28 and July 1, 1941.
- M2** Guide to the operation of 10-cm standard magnetrons. (Report No. 86.) (n.a.) MIT, Radiation Laboratory. October 20, 1941.
- M3** The development of magnetron generators of high power and of short wave lengths. (Report No. 431.) J. B. Fisk. NDCrc-174. Bell Telephone Laboratories, Inc. January 10, 1942.
- M4** Radio frequency loading of 10-cm magnetrons. (Report No. 221.) F. F. Rieke and J. E. Evans. MIT, Radiation Laboratory. August 24, 1942.
- M5** Performance characteristics of the magnetron under conditions simulating beacon operation tube, Types 2J-38 and 2J-22. (Report No. 227.) Kenneth R. More. MIT, Radiation Laboratory. June 30, 1943.
- M6** Magnetron starting time. (Report No. 509.) Kenneth R. More and H. A. Miley. OEMsr-262. MIT, Radiation Laboratory. March 14, 1944.
- M7** [The S-band magnetron transmit-receiver.] (Final Report No. 559, to January, 1944.) Charles F. Chubb, Jr. OEMsr-262. MIT, Radiation Laboratory. June 13, 1944.
- M8** Effects of variation of vane width and cathode size on the operation of magnetrons. (Report No. 586.)

Monica Healea. OEMsr-262. MIT, Radiation Laboratory. August 1, 1944.

- M9** Magnetrons and detector, beat-oscillator receivers. (Report No. 450.) (n.a.) NDCrc-175. Bell Telephone Laboratories, Inc. June, 1945.

232.12 Resonant Modes

- M1** Resonant modes of the magnetron. (Report No. 182.) J. C. Slater. MIT, Radiation Laboratory. August 31, 1942.
- M2** The elimination of extraneous resonance effects in tunable magnetrons. (Report No. 233.) A. Ashkin, P. Kusch and A. Nordsieck. OEMsr-485. Columbia University, Radiation Laboratory. January 14, 1944.
- M3** The resonant modes of the rising-sun, A-tube, anode. (Report No. 323.) N. Kroll and W. Lamb. OEMsr-485. Columbia University, Radiation Laboratory. October 25, 1944.
- M4** Equivalent circuit for resonant modes of a magnetron. Zero mode. (Report No. 322.) W. Lamb. OEMsr-485. Columbia University, Radiation Laboratory. October 25, 1944.
- M5** Mode selection in magnetrons. (Report No. 809.) R. C. Fletcher and F. F. Rieke. OEMsr-262. MIT, Radiation Laboratory. September 28, 1945.
- M6** A method for calculating magnetron resonant frequencies and modes. (Report No. 1039.) Frank E. Bothwell and Prescott D. Crout. OEMsr-262. MIT, Radiation Laboratory. February 8, 1946.

232.13 Strapping

- M1** Strapping tolerances for magnetrons. (Report No. 222.) Edgar Everhart. MIT, Radiation Laboratory. December 31, 1942.
- M2** Magnetron strapping wave length calculations for strapped magnetrons. (Report No. 223.) Edgar Everhart. MIT, Radiation Laboratory. January 27, 1943.

232.14 Cathodes

- M1** Magnetron cathode studies. (Report Nos. 148, 169, 187, 209 and 251.) W. F. G. Swann, W. E. Danforth and others. OEMsr-358. Bartol Research Foundation. May 1, July 1, September 1 and November 1, 1943; January 1, 1944.
- M2** Magnetron cathode studies. Final report of OSRD Contract OEMsr-358. (Report No. 545.) W. E. Danforth, Martin A. Pomerantz and others. OEMsr-358. Bartol Research Foundation. October 31, 1945.

232.141 Oxide-Coated

- M1** Sparking of oxide-coated cathodes. (Report No. 296.) W. E. Ramsey. OEMsr-358. Bartol Research Foundation. July 15, 1944.
- M2** Secondary electron emission from oxide-coated magnetron cathodes. (Report No. 310.) Martin A. Pomerantz and Daniel L. Goldwater. OEMsr-358. Bartol Research Foundation. August 25, 1944.

- M3** Cathodes for pulsed magnetrons. (Part II. Report No. 683.) E. A. Coomes, J. G. Buck and others. OEMsr-262. [MIT, Radiation Laboratory.] January 31, 1945.

- M4** The activation of various surfaces by evaporation from a heated oxide cathode. (Report No. 718.) E. A. Coomes. OEMsr-262. MIT, Radiation Laboratory. May 11, 1945.

- M5** Secondary electron emission from oxide-coated cathodes. (Report No. 515.) Martin A. Pomerantz. OEMsr-358. Bartol Research Foundation. October 15, 1945.

- M6** Effect of particle size. Purification of barium and strontium carbonates. A note on nitrocellulose binders. (Report Nos. 518, 519 and 520.) C. D. Prater. OEMsr-358. Bartol Research Foundation. October 31, 1945.

- M7** High voltage oxide-coated vacuum rectifiers. (Report No. 892.) K. J. Germeshausen and K. J. Urquhart. OEMsr-262. MIT, Radiation Laboratory. December 19, 1945.

- M8** Alkaline earth oxide cathodes for pulsed tubes. (Report No. 933.) E. A. Coomes, J. G. Buck and others. OEMsr-262. MIT, Radiation Laboratory. March 30, 1946.

232.142 Thoria

- M1** Peak currents from carbonized thoriated tungsten cathodes. (Report No. 73.) Winston H. Bostick. MIT, Radiation Laboratory. March 20, 1942.
- M2** Sintered thoria cathodes. (Report No. 517.) Martin A. Pomerantz. OEMsr-358. Bartol Research Foundation. October 31, 1945.

232.143 Miscellaneous Magnetron Cathode Problems

- M1** Cathode temperatures in magnetrons. (Report No. 90.) C. S. Robinson, Jr. MIT, Radiation Laboratory. March 31, 1942.
- M2** Knurled-type cathode. Construction and life test. (Report No. 149.) P. Kusch. Columbia University, Radiation Laboratory. May 26, 1943.
- M3** Cathode sparking. Effect of superimposed direct current and role of coating resistance. (Report No. 295.) W. E. Ramsey, W. E. Danforth and others. Bartol Research Foundation. July 12, 1944.
- M4** Back bombardment of magnetron cathodes. (Report No. 309.) W. E. Danforth, C. D. Prater and Daniel L. Goldwater. OEMsr-358. Bartol Research Foundation. August 25, 1944.
- M5** Cathodes for pulsed magnetrons. (Part I. Report No. 609.) E. A. Coomes, J. G. Buck and A. Fine-man. OEMsr-262. MIT, Radiation Laboratory. August 30, 1944.
- M6** Cathode coating resistance as measured by embedded probes. (Report No. 514.) W. E. Danforth. OEMsr-358. Bartol Research Foundation. October 31, 1945.
- M7** A general survey of sparking phenomena in high-vacuum thermionic tubes. (Report No. 516.)

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W. E. Ramsey. OEMsr-358. Bartol Research Foundation. October 31, 1945.

232.15 Automatic Frequency Control

- M1** An automatic frequency control and frequency selection system for magnetrons. (Report No. 541.) Carl A. Helber. OEMsr-262; Service Project Nos. SC-63.03 and NS-126. MIT, Radiation Laboratory. April 27, 1944.
- M2** Some automatic frequency control circuits. (Report No. 687.) M. W. P. Strandberg. OEMsr-262. MIT, Radiation Laboratory. March 10, 1945.
- M3** Automatic frequency control for AN/APS-31/33. (Report No. 887.) Eric Durand. OEMsr-262; Service Project Nos. AN-21 and NS-314. MIT, Radiation Laboratory. January 17, 1946.
- M4** Automatic frequency control operation and maintenance. (Report No. S-77.) J. G. Jelatis, J. W. Woodbury and H. M. Herraman. OEMsr-262. MIT, Radiation Laboratory. January 25, 1946.
- M5** An automatic frequency control system for magnetrons with beacon applications. (Report No. 1020.) Lowell M. Hollingsworth and R. Dickinson. OEMsr-262. MIT, Radiation Laboratory. March 9, 1946.

232.16 Stabilization and Tuning Problems

- M1** Frequency shift vs magnetron box temperature. (Report No. 220.) H. L. Stout. MIT, Radiation Laboratory. July 3, 1942.
- M2** Adjustment of magnetron frequency by an external tuner. (Report No. 412.) F. F. Rieke. MIT, Radiation Laboratory. September 6, 1943.
- M3** Cold resonance theory of the wave guide tunable magnetron. (Report No. 445.) M. A. Herlin. MIT, Radiation Laboratory. October 15, 1943.
- M4** Magnetron stabilizing tuner. (Report No. 473.) W. M. Preston and J. B. Platt. MIT, Radiation Laboratory. December 2, 1943.
- M5** The tuning properties of tunable magnetrons in the 3-cm band. (Report No. 234.) P. Kusch and A. Nordsieck. OEMsr-485. Columbia University, Radiation Laboratory. January 11, 1944.
- M6** Magnetron stabilizing tuner. (Report No. 71. Supplement to Report No. 473.) W. M. Preston. OEMsr-262; Service Project Nos. SC-63.03 and NS-126. MIT, Radiation Laboratory. May 31, 1944.
- M7** Magnetron tuning and stabilization. (Report No. 567.) W. V. Smith. OEMsr-262. MIT, Radiation Laboratory. July 13, 1944.
- M8** Increasing stability of operation of 4J31-35 magnetrons in the AN/CPS-1 system. (Report No. 621.) H. A. Miley, Kenneth R. More and D. F. Winter. OEMsr-262; Service Project No. SC-60. MIT, Radiation Laboratory. January 26, 1945.
- M9** Influence of pulse transformer design on 4J31-35 magnetron stability. (Report No. 622.) D. F. Winter and H. A. Miley. OEMsr-262. MIT, Radiation Laboratory. August 11, 1945.

M10 The 4J70-77 series of tunable magnetrons. (Report No. 1006.) A. G. Smith. OEMsr-262. MIT, Radiation Laboratory. February 4, 1946.

M11 Wide range tunable stabilizer. (Report No. 964.) M. A. Herlin. OEMsr-262. MIT, Radiation Laboratory. February 21, 1946.

232.17 Cavities

- M1** Input impedance and tuning of magnetron cavities. (Report No. 190.) J. C. Slater. MIT, Radiation Laboratory. February 3, 1943.
- M2** The resonant modes of magnetron cavities. (Report No. 493.) H. Goldstein. MIT, Radiation Laboratory. December 14, 1943.

232.18 Spectrum Characteristics

- M1** Frequency and spectrum characteristics of standard magnetrons and the effect of change of shape of current pulse. (Report No. 225.) R. T. Young, Jr. MIT, Radiation Laboratory. March 12, 1943.
- M2** Spectra of magnetrons for long pulses. (Report No. 228.) R. T. Young, Jr. MIT, Radiation Laboratory. July 5, 1943.

232.19 Miscellaneous Magnetron Problems

- M1** Transmitter Tube Section. (Report Nos. 83 and 84.) (n.a.) MIT, Radiation Laboratory. March 18 and May 19, 1941.
- M2** Theory of the magnetron oscillator. (Report No. 118.) J. C. Slater. MIT, Radiation Laboratory. August, 1941.
- M3** Theory of the magnetron oscillator. Electronic orbits in the cylindrical magnetron with static fields. (Report No. 122.) W. P. Allis. MIT, Radiation Laboratory. October, 1941.
- M4** The components testing system. (Report Nos. 41 and 42.) (n.a.) MIT, Radiation Laboratory. October 8 and November 12, 1941.
- M5** Theory of the split-anode magnetron. (Report No. 127.) Leon Brillouin. MIT, Radiation Laboratory. January 7, 1942.
- M6** Outline for a theory of the space charge in an oscillating magnetron. (Report No. 176.) W. P. Allis. MIT, Radiation Laboratory. July 1, 1942.
- M7** A numerical calculation of space charge behavior and power in the magnetron. (Report No. 201.) George H. Vineyard. MIT, Radiation Laboratory. March 29, 1943.
- M8** Maximum allowable negative backswing after pulses. (Report No. 363.) R. Rollefson and R. M. Ashby. MIT, Radiation Laboratory. April 13, 1943.
- M9** Scaling and relative efficiency of different sized magnetrons. (Report No. 176.) W. F. G. Swann. OEMsr-358. Bartol Research Foundation. August 6, 1943.
- M10** Field patterns in cold magnetrons, including correlation with tube performance and tunable design. (Report No. 230.) W. V. Smith and A. G. Smith. MIT, Radiation Laboratory. August 10, 1943.

- M11** Effect on current pulse of resistance in series with the magnetron. (Report No. 527.) Winston H. Bostick. OEMsr-262. MIT, Radiation Laboratory. February 21, 1944.
- M12** Proposed method for measuring instantaneous magnetron input impedance with aid of a delay network. (Report No. 515.) O. T. Fundingsland. OEMsr-262. MIT, Radiation Laboratory. February 22, 1944.
- M13** [The HK-7 and HP-10V magnetrons.] Development work done on Contract OEMsr-1146. (Report No. 423.) T. H. Rogers. OEMsr-1146. Machlett Laboratories, Inc. April 1, 1945.
- M14** Preliminary oscillographic studies of radio frequency build-up in magnetrons. (Report No. 543.) R. C. Fletcher and G. M. Lee. OEMsr-191. MIT, Laboratory for Insulation Research. November, 1945.
- M15** Radio frequency phasing of pulsed magnetrons. (Report No. 1051.) J. E. Evans, R. C. Fletcher and F. F. Rieke. OEMsr-262. MIT, Radiation Laboratory. February 6, 1946.
- M16** LCT, [a] 900 mc/sec frequency-modulated continuous-wave magnetron. (Report No. 1005.) A. L. Vitter, Jr., P. W. Forsbergh, Jr. and G. C. Dewey. OEMsr-262. MIT, Radiation Laboratory. February 28, 1946.
- M17** XCT final report. (Report No. 879.) W. V. Smith, M. A. Herlin and H. G. Weightman. OEMsr-262. MIT, Radiation Laboratory. March 6, 1946.

232.2 Low Power Transmitter Tubes

- M1** Tests of Radio Corporation of America and General Electric lighthouse tubes. (Report No. 290.) J. B. H. Kuper, P. A. Cole and Frances S. Bailey. MIT, Radiation Laboratory. January 11, 1943.
- M2** Lighthouse tube anode contacts. (Report No. 292.) P. A. Cole. MIT, Radiation Laboratory. January 19, 1943.
- M3** Measurements on 446 lighthouse tubes. (Report No. 413.) P. A. Cole. MIT, Radiation Laboratory. August 30, 1943.
- M4** General Electric GL-2C40 taut grid lighthouse tubes. (Report No. 600.) P. A. Cole. OEMsr-262. MIT, Radiation Laboratory. November 14, 1944.

232.21 SB-846B Oscillator

- M1** [The] SB-846B S-band oscillator. (Report No. 954.) John C. Reed. OEMsr-262. MIT, Radiation Laboratory. February 26, 1946.

232.3 Resnatron Oscillator

- M1** The resnatron ultra high frequency oscillator. (Report No. 593.) Lauriston C. Marshall(?) NDCrc-25. University of California. April 10, 1946.

233 Radio Frequency Components

- M1** Radio frequency components. (List No. 1. Report

No. 151.) (n.a.) MIT, Radiation Laboratory. January 20, 1942.

- M2** Tuning the radio frequency components of a system, Lawson technique. (Report No. 11.) (n.a.) MIT, Radiation Laboratory. February 20, 1942.
- M3** Handbook of operating and maintenance instructions for dummy load, TS-253/AP. (Report No. M-216.) F. B. Wood. OEMsr-262; Service Project No. SC-106.06. MIT, Radiation Laboratory. April 9, 1945.
- M4** Radio frequency components for microwave bridges. (Report No. 528.) (n.a.) OEMsr-335. Polytechnic Institute of Brooklyn. October 31, 1945.
- M5** Development of miscellaneous radio frequency line components. (Report No. 533.) (n.a.) OEMsr-335. Polytechnic Institute of Brooklyn. October 31, 1945.
- M6** Radar radio frequency test points. (Report No. S-68.) A. H. Brown. OEMsr-262. MIT, Radiation Laboratory. December 15, 1945.

233.1 Crystal Rectifiers

- M1** Crystals. (Report No. 153.) N. Rochester. MIT, Radiation Laboratory. February 17, 1942.
- M2** Theory of high-frequency rectification by silicon crystals. (Report No. 184.) H. A. Bethe. MIT, Radiation Laboratory. October 29, 1942.
- M3** A simple method for determination of the law of a crystal. (Report No. 270.) H. Krutter. MIT, Radiation Laboratory. April 29, 1943.
- M4** Temperature variation of low-level crystal performance. (Report No. 308.) A. H. Smith, B. Serin and others. OEMsr-388. University of Pennsylvania. August 17, 1944.
- M5** Handy guide to crystal types. ([Parts] I to III. Report Nos. 405, 405S and 499.) W. E. Stephens. OEMsr-388. University of Pennsylvania. February 15, May 10 and September 25, 1945.
- M6** Test on German crystals. (Report No. 559.) M. H. Greenblatt. OEMsr-388. University of Pennsylvania. October 11, 1945.

233.11 Types

- M1** Electron microscopy of tungsten points. (Report No. 125.) Andrew W. Lawson and W. E. Stephens. OEMsr-388. University of Pennsylvania. March 10, 1943.

233.111 Germanium

- M1** The electrical conductivity of silicon and germanium. (Report No. 110.) Frederick Seitz, Jr. OEMsr-388. University of Pennsylvania. November 3, 1942.
- M2** Compounds of silicon and germanium. (Report No. 112.) Frederick Seitz, Jr. OEMsr-388. University of Pennsylvania. November 18, 1942.
- M3** Quantitative spectroscopic analysis of impurities in germanium and silicon. (Report No. 285.)

- Wayne Scanlon. OEMsr-362. Purdue University. May 5, 1944.
- M4** K-band germanium crystals. (Report Nos. 328, 381 and 406 [for the period] from August 15, 1944 to February 15, 1945.) H. Q. North. OEMsr-1377. General Electric Company. October and November, 1944 and February, 1945.
- M5** Evaporated films of germanium and silicon. (Report No. 337.) Margaret N. Lewis, J. H. Taylor and R. J. Gibson. OEMsr-388. University of Pennsylvania. October 10, 1944.
- M6** Preparation of high-voltage germanium crystals. (Report No. 341.) R. M. Whaley and Paul B. Pickar. OEMsr-362. Purdue University. November 1, 1944.
- M7** The high-voltage germanium rectifier. Section 1, Experimental. (Report No. 342.) S. Benzer. OEMsr-362. Purdue University. November 1, 1944.
- M8** Development of high-back voltage germanium rectifiers. (Report No. 374.) H. C. Theuerer and J. H. Scaff. OEMsr-1408. [Bell Telephone Laboratories, Inc.] November 21, 1944.
- M9** [Investigations of the germanium second detector units.] Interim Report No. 2. (Report No. 399.) H. C. Theuerer and J. H. Scaff. OEMsr-1408. [Bell Telephone Laboratories, Inc.] December 16, 1944.
- M10** The high-voltage germanium rectifier. Section 2, Theoretical. (Report No. 375.) S. Benzer. OEMsr-362. Purdue University. December 26, 1944.
- M11** [The work on germanium conducted in the interval from December 15, 1944 to February 15, 1945.] (Report No. 441.) H. C. Theuerer and J. H. Scaff. OEMsr-1408. [Bell Telephone Laboratories, Inc.] March 13, 1945.
- M12** Properties of germanium high-back voltage rectifier units. (Report No. 413.) L. L. Boyarsky, R. N. Smith and H. J. Yearian. OEMsr-362. Purdue University. March 19, 1945.
- M13** K-band germanium crystals. (Final Report No. 427.) H. Q. North. OEMsr-1377. General Electric Company. March 26, 1945.
- M14** Dependence of performance on germanium second detector units on bias and video load. (Report No. 416.) L. L. Boyarsky and R. N. Smith. OEMsr-362. Purdue University. March 28, 1945.
- M15** Heat treatment of germanium rectifier materials. (Report No. 506.) H. C. Theuerer and J. H. Scaff. OEMsr-1408. [Bell Telephone Laboratories, Inc.] August 3, 1945.
- M16** The generation of harmonics by silicon and germanium crystals. (Report No. 818.) Dorothy D. Montgomery. OEMsr-262; Service Project No. AN-25. MIT, Radiation Laboratory. October 23, 1945.
- M17** Preparation of high-back voltage germanium rectifiers. (Report No. 555.) J. H. Scaff and H. C. Theuerer. OEMsr-1408. Bell Telephone Laboratories, Inc. October 24, 1945.
- M18** Further developments in the preparation and heat treatment of germanium alloys. (Report No. 576.) R. M. Whaley. OEMsr-362. Purdue University. October 31, 1945.
- M19** Photoelectric effects in germanium. (Report No. 580.) S. Benzer. OEMsr-362. Purdue University. October 31, 1945.
- M20** Dependence of forward conductance and back resistance of high-back voltage germanium on voltage and frequency. (Report No. 581.) H. J. Yearian. OEMsr-362. Purdue University. October 31, 1945.
- M21** Temperature dependence of high-voltage germanium rectifier direct current characteristics. (Report No. 579.) S. Benzer. OEMsr-362. [Purdue University.] October 31, 1945.
- M22** Production and performance of germanium high-back voltage, high-back resistance crystal rectifier. (Report No. 577.) L. L. Boyarsky, Paul B. Pickar and others. OEMsr-362. Purdue University. October 31, 1945.
- 233.112 Silicon**
- M1** Theory of the boundary layer of crystal rectifiers. (Report No. 185.) H. A. Bethe. MIT, Radiation Laboratory. November 23, 1942.
- M2** Direct current burn-out temperature in silicon rectifiers. (Report No. 113.) Andrew W. Lawson, Robert J. Maurer and others. OEMsr-388. University of Pennsylvania. January 2, 1943.
- M3** Maximum power limitations of silicon crystals. (Report No. 359.) Bruce Cork. MIT, Radiation Laboratory. January 11, 1943.
- M4** Effect of etch on crystal rectifiers. (Report No. 165.) Andrew W. Lawson and W. E. Stephens. OEMsr-388. University of Pennsylvania. March 10, 1943.
- M5** Spectroscopic determination of aluminum in silicon. (Report No. 127.) Andrew W. Lawson and Park H. Miller, Jr. OEMsr-388. University of Pennsylvania. March 10, 1943.
- M6** Capacity in crystal rectifiers. (Report No. 166.) Andrew W. Lawson, Park H. Miller, Jr. and W. E. Stephens. OEMsr-388. University of Pennsylvania. March 10, 1943.
- M7** Barrier capacity in silicon cartridge rectifiers. (Report No. 140.) Andrew W. Lawson, Park H. Miller, Jr. and others. OEMsr-388. University of Pennsylvania. May 1, 1943.
- M8** Radioactive detection of aluminum in silicon. (Report No. 180.) Andrew W. Lawson, Park H. Miller, Jr. and others. OEMsr-388. University of Pennsylvania. September 1, 1943.
- M9** Effect of tapping on barrier capacity. (Report No. 181.) Andrew W. Lawson, Park H. Miller, Jr. and others. OEMsr-388. University of Pennsylvania. September 1, 1943.
- M10** Behavior of silicon crystals at low-level powers. (Report No. 182.) Andrew W. Lawson, Park H.

Miller, Jr. and others. OEMsr-388. University of Pennsylvania. September 1, 1943.

- M11** Behavior of Westinghouse silicon as a low-level detector. (Report No. 186.) Andrew W. Lawson and Margaret N. Lewis. OEMsr-388. University of Pennsylvania. September 20, 1943.
- M12** Noise in silicon rectifiers at low temperatures. (Report No. 189.) Andrew W. Lawson, Park H. Miller, Jr. and W. E. Stephens. OEMsr-388. University of Pennsylvania. October 1, 1943.
- M13** Comparison of wedge and cone contacts on Fox silicon. (Report No. 197.) Andrew W. Lawson, Margaret N. Lewis and others. OEMsr-388. University of Pennsylvania. October 22, 1943.
- M14** Analysis of silicon for non-volatile matter. (Report No. 204.) K. A. Krieger and Andrew W. Lawson. OEMsr-388. University of Pennsylvania. November 11, 1943.
- M15** Recent research on silicon rectifiers. (Report No. 224.) Andrew W. Lawson, Margaret N. Lewis and others. OEMsr-388. University of Pennsylvania. January 1, 1944.
- M16** Noise spectrum of silicon rectifiers. (Report No. 256.) Park H. Miller, Jr., Margaret N. Lewis and others. OEMsr-388. University of Pennsylvania. March 20, 1944.
- M17** Production and effects of a depletion layer in doped silicon. (Report No. 282.) B. Serin and W. E. Stephens. OEMsr-388. University of Pennsylvania. May 29, 1944.
- M18** Effect of heat treatment on low-level performance. (Report No. 304.) B. Serin and W. E. Stephens. OEMsr-388. University of Pennsylvania. August 3, 1944.
- M19** Photoeffects in pure silicon. (Report No. 412.) Park H. Miller, Jr. and M. H. Greenblatt. OEMsr-388. University of Pennsylvania. March 20, 1945.
- M20** High-back voltage silicon. (Report No. 453.) Margaret N. Lewis, J. H. Taylor and others. OEMsr-388. University of Pennsylvania. June 28, 1945.
- M21** Mass spectrometer investigation of the silicon tetrachloride used in making pure silicon. (Report No. 558.) Robert H. Vought. OEMsr-388. University of Pennsylvania. October 5, 1945.
- M22** Geometrical structure of silicon surfaces. (Report No. 563.) W. E. Meyerhof and W. E. Stephens. OEMsr-388. University of Pennsylvania. October 10, 1945.

233.113 Boron

- M1** Sintering or melting of boron powder. (Report Nos. 229, 231, 232, 240, 252, 262, 272, 283, 292 and 307, for the period August 1943 to August, 1944.) C. E. Rick and T. D. McKinley. OEMsr-1139. E. I. duPont de Nemours and Company, Inc.
- M2** Sintering or melting of boron and preparation of hyperpure germanium. (Report Nos. 318, 324 and 362, for the period August, 1944 to November,

1944.) C. E. Rick and T. D. McKinley. OEMsr-1139. E. I. duPont de Nemours and Company, Inc.

- M3** Sintering or melting of boron and preparation of hyperpure germanium. (Parts I and II. Report No. 386.) T. D. McKinley. OEMsr-1139. E. I. duPont de Nemours and Company, Inc. (n.d.)

233.12 Detectors and Mixers

- M1** Comparative signal noise measurements on crystal mixers and grounded grid tube mixers. (Report No. 110.) M. G. White. MIT, Radiation Laboratory. December 17, 1941.
- M2** Theory of radar mixers. (Report No. 287.) R. H. Dicke and S. Roberts. MIT, Radiation Laboratory. July 15, 1942.
- M3** An S-band crystal mixer. (Report No. 242.) R. V. Pound. MIT, Radiation Laboratory. December 14, 1942.
- M4** Low-level crystal detectors. (Report No. 297.) R. Beringer. MIT, Radiation Laboratory. March 16, 1943.
- M5** A reciprocity theorem and its application to measurement of gain of microwave crystal mixers. (Report No. 300.) R. H. Dicke. MIT, Radiation Laboratory. April 13, 1943.
- M6** Theory of signal-to-noise ratio of crystal mixers. (Report No. 162.) Henry Hurwitz, Jr. OEMsr-429. Cornell University. May 1, 1943.
- M7** The theory of crystal mixers in terms of measurable mixer constants. (Report No. 259.) R. N. Smith and E. S. Akeley. OEMsr-362. Purdue University. March 24, 1944.
- M8** Crystal detectors and the crystal-video receiver. (Report No. 638.) R. Beringer. OEMsr-262. MIT, Radiation Laboratory. November 16, 1944.
- M9** Dependence of noise temperature direct current and intermediate frequency crystal conductance on matching conditions. (Report No. 578.) H. J. Yearian. OEMsr-362. Purdue University. October 30, 1945.
- M10** Distortion in X-band detectors. (Report No. 956.) M. W. P. Strandberg. OEMsr-262. MIT, Radiation Laboratory. December 27, 1945.
- M11** A broad-band balanced mixer for S-band. (Report No. 916.) William D. Hope. OEMsr-262. MIT, Radiation Laboratory. January 23, 1946.
- M12** Performance of microwave harmonic mixers. (Report No. 958.) D. L. Falkoff. OEMsr-262. MIT, Radiation Laboratory. March 11, 1946.

233.13 Rectification Properties

- M1** The principles of crystal rectifiers. (Report No. 102.) Frederick Seitz, Jr. and S. Pasternack. OEMsr-388. University of Pennsylvania. June 10, 1942.
- M2** Theory of crystal rectifiers. (Report No. 129.) R. G. Sachs. OEMsr-362. Purdue University. September 10, 1942.
- M3** Theory of contact rectifiers. (Report No. 168.)

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R. G. Sachs. OEMsr-362. Purdue University. June 15, 1943.

- M4** Research and development of crystal rectifiers. (Report No. 562.) W. E. Stephens and Park H. Miller, Jr. OEMsr-388. University of Pennsylvania. October 22, 1945.

233.131 Noise Factors

- M1** Noise in crystal rectifiers. (Report No. 126.) Leonard I. Schiff. OEMsr-388. University of Pennsylvania. March 10, 1943.
- M2** Dependence of intermediate frequency impedance and noise temperature of crystal rectifiers on matching conditions. (Report No. 194.) Andrew W. Lawson, Park H. Miller, Jr. and W. E. Stephens. OEMsr-388. University of Pennsylvania. October 6, 1943.
- M3** A feedback circuit for measuring output noise ratio of crystal rectifiers. (Report No. 667.) S. Roberts. OEMsr-262. MIT, Radiation Laboratory. January 10, 1945.

233.132 Direct Current Characteristics

- M1** Investigation of crystal rectifier direct current characteristics. (Report No. 115.) H. J. Yearian. OEMsr-362. Purdue University. December 3, 1942.
- M2** Further direct current burn-out experiments on silicon and germanium rectifiers. (Report No. 119.) Andrew W. Lawson, Robert J. Maurer and others. OEMsr-388. University of Pennsylvania. [January 1, 1943.]

233.133 High-Frequency Characteristics

- M1** High-frequency rectification efficiency of crystals. (Report No. 153.) Andrew W. Lawson, Park H. Miller, Jr. and others. OEMsr-388. University of Pennsylvania. July 1, 1943.
- M2** High-frequency characteristics of rectifiers. (Report No. 284.) Karl F. Herzfeld. OEMsr-362. Purdue University. May 5, 1944.

233.134 Miscellaneous Rectification Problems

- M1** Ionization of donator levels in crystal rectifiers by thermal agitation. (Report No. 173.) Andrew W. Lawson, Park H. Miller, Jr. and others. OEMsr-388. University of Pennsylvania. July 7, 1943.
- M2** Operation of 1N-23 crystal rectifiers. (Report No. 496.) S. Roberts. MIT, Radiation Laboratory. December 14, 1943.
- M3** Manufacturing procedure for the Radiation Laboratory high burn-out crystals. (Report No. 501.) Marvin Fox, C. S. Pearsall and Virginia Powell. MIT, Radiation Laboratory. December 21, 1943.
- M4** Theory of small deviations from pure diode behavior. (Report No. 286.) Karl F. Herzfeld. OEMsr-362. Purdue University. May 5, 1944.
- M5** Some comments on the double-valued characteristics of crystal rectifiers. (Report No. 504.)

B. Goodman. OEMsr-388. University of Pennsylvania. September 18, 1945.

- M6** Use of different fillers in crystal rectifiers. (Report No. 561.) A. H. Smith. OEMsr-388. University of Pennsylvania. October 18, 1945.
- M7** Preparation of semi-conductors and development of crystal rectifiers. (Report No. 585, covering the period from March, 1942 to November, 1945.) K. Lark-Horovitz. OEMsr-362. Purdue University. November, 1945.
- M8** Crystal capacity as a function of bias and its relation to the theory of crystal rectification. (Report No. 584.) R. N. Smith. OEMsr-362. Purdue University. March 16, 1946.

233.14 Conversion Loss and Gain Problems

- M1** Measurement of conversion gain with a modulated oscillator. (Report No. 144.) R. N. Smith. OEMsr-362. Purdue University. April 20, 1943.
- M2** A simplified analysis of conversion loss of crystal converters. (Report No. 253.) S. Roberts. MIT, Radiation Laboratory. July 3, 1943.
- M3** Comparison of the usual methods of measuring conversion loss of crystals and a new empirical method. (Report No. 408.) S. Roberts and C. Whitmer. MIT, Radiation Laboratory. August 31, 1943.
- M4** [The] 1N-21 loss tester, Type 7556. (Report No. M-177.) H. B. Huntington. OEMsr-262. MIT, Radiation Laboratory. August 21, 1944.

233.15 Crystal Measurements and Tests

- M1** Theory of noise measurements on crystals as frequency converters. (Report No. 293.) S. Roberts. MIT, Radiation Laboratory. January 30, 1943.
- M2** Crystal noise as a function of direct current bias and 30-mc impedance measured with a diode noise source. (Report No. 167.) R. N. Smith. OEMsr-362. Purdue University. June 25, 1943.
- M3** Conversion loss measuring apparatus for crystals in the 3-cm band. (Report No. 257.) S. Roberts. MIT, Radiation Laboratory. August 3, 1943.
- M4** Crystal life tests under flat pulses. (Report No. 543.) H. B. Huntington. OEMsr-262. MIT, Radiation Laboratory. April 7, 1944.
- M5** [The] 1N-23 loss measuring set. (Report No. M-171.) S. Roberts. OEMsr-262. MIT, Radiation Laboratory. June 29, 1944.

233.151 Crystal Noise Factors

- M1** Noise measurements on microwave converters. (Report No. 289.) William M. Breazeale. MIT, Radiation Laboratory. September 15, 1942.
- M2** Noise temperature measuring apparatus for crystals as 10,000 to 30-megacycle converters. (Report No. 296.) S. Roberts. MIT, Radiation Laboratory. February 11, 1943.
- M3** Audio noise tester. (Report No. 267.) Park H. Miller, Jr., M. H. Greenblatt and W. E. Stephens.

OEMsr-388. University of Pennsylvania. May 10, 1944.

- M4** Note on the measurement of noise temperature. (Report No. 311.) Park H. Miller, Jr., B. Goodman and M. H. Greenblatt. OEMsr-388. University of Pennsylvania. August 24, 1944.

- M5** [The] 1N-23 noise measuring set, Type 7438. (Report No. M-190.) S. Roberts. OEMsr-262. MIT, Radiation Laboratory. December 21, 1944.

- M6** Crystal audio noise. (Report No. 387.) Park H. Miller, Jr. and M. H. Greenblatt. OEMsr-388. University of Pennsylvania. January 5, 1945.

- M7** [The] 1N-21 noise tester, Type 11044. (Report No. M-191.) H. B. Huntington. OEMsr-262. MIT, Radiation Laboratory. January 9, 1945.

233.152 Tests

- M1** Testing of 1N-21 Navy crystal rectifiers. (Report No. 256.) H. B. Huntington, S. Roberts and others. MIT, Radiation Laboratory. July 12, 1943.

- M2** A device for the selection and manufacture of low-level detectors. (Report No. 201.) Andrew W. Lawson, Margaret N. Lewis and others. OEMsr-388. University of Pennsylvania. October 27, 1943.

- M3** A conversion loss set for testing K-band crystal rectifiers. (Report No. 668.) C. A. Whitmer. OEMsr-262. MIT, Radiation Laboratory. January 16, 1945.

- M4** Test equipment for germanium second detector units. (Report No. 394.) R. N. Smith and H. J. Yearian. OEMsr-362. Purdue University. January 25, 1945.

233.2 Radio Frequency Heads

- M1** Western Electric 717-A modulator, Type D-150442 and radio frequency unit, Type D-150452. (Report No. 425.) H. J. Hall. OEMsr-262. MIT, Radiation Laboratory. February 28, 1944.

- M2** Aircraft radar equipment. Handbook of maintenance instructions for Army-Navy Model RT-63/APS and British Model 110 DB/206. (Report No. 495.) (n.a.) US Army and Navy Departments and Air Council of the United Kingdom. March 10, 1945.

- M3** [The] development and production of fifty K-band radio frequency heads by Sylvania Electric Products, Inc., Report on Contract OEMsr-1186. (Report No. 496.) (n.a.) OEMsr-1186. Sylvania Electric Products, Inc. July 6, 1945.

- M4** [The] AN/APQ-34 radio frequency head. (Report No. 888.) A. E. Whitford and Eric Durand. OEMsr-262. MIT, Radiation Laboratory. December 31, 1945.

- M5** One-knob tunable X-band radio frequency head. (Report No. 1019.) M. W. P. Strandberg. OEMsr-262. MIT, Radiation Laboratory. January 23, 1946.

- M6** [The] AN/APS-31/33 radio frequency unit. (Re-

port No. 886.) H. K. Farr. OEMsr-262; Service Project Nos. AN-21 and NS-314. MIT, Radiation Laboratory. March 14, 1946.

233.3 Duplexing

- M1** Rat race duplexing. (Report No. 885.) John C. Reed. OEMsr-262. MIT, Radiation Laboratory. February 4, 1946.

233.31 Transmit-Receive (TR) Tubes

- M1** Pre-plumbing of tees for G-band. (Report No. 238.) R. V. Pound and Rose Berger. MIT, Radiation Laboratory. November 3, 1942.

- M2** Transmit-receive tubes. (Progress Report No. 360.) Albert M. Stone. MIT, Radiation Laboratory. January 11, 1943.

- M3** Comparison of the frequency sensitivities of series and shunt transmit-receive junctions. (Report No. 247.) R. V. Pound. MIT, Radiation Laboratory. January 20, 1943.

- M4** Measurements on 721-A transmit-receive tube leakage power. (Report No. 249.) L. D. Smullin. MIT, Radiation Laboratory. March 9, 1943.

- M5** Details of an X-band high-level transmit-receive tube test bench. (Report No. 417.) J. B. Wiesner. MIT, Radiation Laboratory. February 3, 1944.

- M6** Chemical methods for maintaining the partial pressure of water vapor in transmit-receive tubes. (Report No. 593.) Robert Levine and F. L. McMillan, Jr. OEMsr-262. MIT, Radiation Laboratory. July 13, 1944.

- M7** Development of 1B-27. (Report No. 315.) O. H. Biggs. OEMsr-999. Sylvania Electric Products, Inc. September 19, 1944.

- M8** Broad-band transmit-receive and anti-transmit-receive tubes. (Report No. 402.) A. L. Samuel, C. F. Crandell and J. E. Clark. OEMsr-1218. Bell Telephone Laboratories, Inc. September 30, 1944.

- M9** The 1B-27 transmit-receive tube. (Report No. 594.) L. D. Smullin and H. A. Leiter. OEMsr-262. MIT, Radiation Laboratory. October 4, 1944.

- M10** [The] 1B-38 pre-transmit-receive [tubes]. (Report No. 641.) L. D. Smullin. MIT, Radiation Laboratory. December 5, 1944.

- M11** Broad-band transmit-receive tube development. (Report No. 594.) M. D. Fiske, H. N. Wallace and A. D. Warner. OEMsr-1306. General Electric Company. November 7, 1945.

- M12** Recovery time measurements in band-pass transmit-receive [tubes] for various gases. (Report No. 895.) F. L. McMillan, Jr., I. H. Dearnley and C. H. Pearsall. OEMsr-262. MIT, Radiation Laboratory. December 18, 1945.

- M13** [An] X-band band-pass transmit-receive tube. (Report No. 970.) W. C. Caldwell. OEMsr-262. MIT, Radiation Laboratory. January 22, 1946.

- M14** S-band band-pass transmit-receive tubes. (Report No. 971.) L. D. Smullin. OEMsr-262. MIT, Radiation Laboratory. January 23, 1946.

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233.311 Gas-Switch

- M1** Transmit-receive switch. (Report No. 150.) (n.a.) MIT, Radiation Laboratory. January 20, 1942.
- M2** Pre-ignition transmission through gas-switching tubes, and its contribution to crystal failures. (Report No. 254.) F. L. McMillan, Jr. and J. B. Wiesner. MIT, Radiation Laboratory. July 3, 1943.
- M3** Preliminary measurements on a General Electric X-band transmit-receiver gas switch. (Report No. 225.) A. L. Samuel and C. F. Crandell. Bell Telephone Laboratories, Inc. November 26, 1943.
- M4** Broad-band fixed-tuned transmit-receive and anti-transmit-receive gas-switching tubes. (Report No. 401.) Milan D. Fiske. OEMsr-1306. General Electric Company. December 22, 1944.

233.312 Transmit-Receive Box

- M1** The transmit-receive box. (Report No. 347.) James L. Lawson. MIT, Radiation Laboratory. May 13, 1942.
- M2** Measurement of the Q-value of a transmit-receive box. (Report No. 349.) James L. Lawson and R. L. McCreary. MIT, Radiation Laboratory. July 13, 1942.
- M3** Direct coupling in the transmit-receive box. (Report No. 352.) R. L. McCreary. MIT, Radiation Laboratory. November 3, 1942.
- M4** Various 3-cm transmit-receive box characteristics. (Report No. 166.) N. C. Colby and C. W. Zabel. MIT, Radiation Laboratory. January 6, 1943.
- M5** Some experiments in determining the power transmission and recovery time of transmit-receive boxes. (Report No. 362.) Bruce Cork. MIT, Radiation Laboratory. January 20, 1943.
- M6** Theoretical results on the transmit-receive box. (Report No. 116.) H. A. Bethe, R. E. Marshak and Julian Schwinger. OEMsr-429. [Cornell University and] MIT, Radiation Laboratory. January 20, 1943.
- M7** Theory of the transmit-receive box. (Report No. 128.) H. A. Bethe, R. E. Marshak and Julian Schwinger. OEMsr-429. [Cornell University and] MIT, Radiation Laboratory. May 14, 1943.
- M8** The fixed-tuned broad-band transmitter disconnect switch. Some preliminary considerations. (Report No. 261.) A. L. Samuel. OEMsr-1218. Bell Telephone Laboratories, Inc. March 28, 1944.
- M9** Theoretical interpretation of recovery times of transmit-receive boxes. (Report No. 929.) Henry Margenau. OEMsr-262. MIT, Radiation Laboratory. January 9, 1946.

233.32 Antitransmit-Receive (ATR) Tubes

- M1** Testing of fixed-tuned, low Q, antitransmit-receive tubes. (Report No. 611.) L. D. Smullin. OEMsr-262. MIT, Radiation Laboratory. December 6, 1944.

233.4 Transmission Lines and Components**233.41 Transmission Lines**

- M1** Impedance in transmission lines and wave guides. (Part I. Report No. 116.) Philip M. Morse. [MIT, Radiation Laboratory.] April 15, 1941.
- M2** Transmission lines and wave guides. Similarities and differences. (Report No. T-5.) N. H. Frank. MIT, Radiation Laboratory. June 4, 1942.
- M3** Information on corrugated coaxial lines and wave guides. (Report No. 264.) G. G. Harvey. MIT, Radiation Laboratory. December 11, 1942.
- M4** Reflections from sections of tapered transmission lines and wave guides. (Report No. 189.) N. H. Frank. MIT, Radiation Laboratory. January 6, 1943.
- M5** Use and derivation of a Z, Θ chart. (Report No. T-14.) John C. Reed. MIT, Radiation Laboratory. May 18, 1943.
- M6** The theory of corrugated transmission lines and wave guides. (Report No. 494.) H. Goldstein. OEMsr-262. MIT, Radiation Laboratory. April 3, 1944.

233.411 Cables

- M1** Type A and Type B pulse transmission cables and connectors. (Report No. 424.) F. G. Dunnington. MIT, Radiation Laboratory. September 11, 1943.
- M2** Instruction manual for installation of Radiation Laboratory Type A plugs on cables. (Report No. M-150.) R. R. Steinke. OEMsr-262. MIT, Radiation Laboratory. December 29, 1943.
- M3** Instruction manual for installation of Radiation Laboratory Type B plugs on cables. (Report No. M-149.) R. R. Steinke. OEMsr-262. MIT, Radiation Laboratory. December 29, 1943.
- M4** High impedance cable. (Report No. 529.) Heinz E. Kallmann. OEMsr-262. MIT, Radiation Laboratory. March 13, 1944.
- M5** Attenuation of RG-9/U cable as a function of temperature and frequency in the X-band. (Report No. 754.) F. Edward Ehlers. OEMsr-262. MIT, Radiation Laboratory. June 18, 1945.

233.412 Wave Guides

- M1** Wave guide termination for measuring power at 3.2 cm. (Report No. 89.) (n.a.) MIT, Radiation Laboratory. February 24, 1942.
- M2** Propagation in wave guides partly filled with a dielectric. (Report No. 174.) N. H. Frank. MIT, Radiation Laboratory. April 27, 1942.
- M3** Radiation resistance of antennas inside wave guides of arbitrary cross-sections. (Report No. 177.) L. J. Chu. MIT, Radiation Laboratory. July 3, 1942.
- M4** Polarization effects in a circular wave guide at 3 cm. (Report No. 162.) Dorothy D. Montgomery and C. G. Montgomery. MIT, Radiation Laboratory. September 12, 1942.
- M5** Wave guide handbook. (Section I. Report No. T-9.) N. H. Frank. MIT, Radiation Laboratory. September 24, 1942.

- M6** Wave guide handbook. Section II, Attenuation in wave guides. (Report No. T-9.) N. H. Frank. MIT, Radiation Laboratory. October 2, 1942.
- M7** Wave guide handbook. Section III, Obstacles in wave guides. (Report No. T-9.) N. H. Frank. MIT, Radiation Laboratory. November 11, 1942.
- M8** Wave guide components and instruments for the 1.25-cm region. (Report No. 165.) E. M. Purcell. MIT, Radiation Laboratory. December 3, 1942.
- M9** Wave guide handbook. Section V, Dielectric structures in wave guides. (Report No. T-9.) N. H. Frank. MIT, Radiation Laboratory. February 9, 1943.
- M10** Formal theory of wave guides of arbitrary cross-section. (Report No. 198.) H. A. Bethe. MIT, Radiation Laboratory. March 16, 1943.
- M11** The theory of obstacles in resonant cavities and wave guides. (Report No. 205.) Julian Schwinger. MIT, Radiation Laboratory. May 21, 1943.
- M12** Theory of circular bends in rectangular wave guides. (Report No. 206.) R. E. Marshak. MIT, Radiation Laboratory. June 24, 1943.
- M13** Double-dipole rectangular wave guide antennas. (Report No. 273.) William Sichak. MIT, Radiation Laboratory. June 26, 1943.
- M14** [An] X-band wave guide tuning section. (Report No. 222.) John E. Ebert. Polytechnic Institute of Brooklyn. July 23, 1943.
- M15** Wave guide output for 1.25-cm magnetrons. (Report No. 245.) Sidney Millman. OEMsr-485. Columbia University, Radiation Laboratory. February 1, 1944.
- M16** [A] vertebrae-type flexible wave guide. (Report No. 574.) E. L. Younker. OEMsr-262. MIT, Radiation Laboratory. June 15, 1944.
- M17** Transmission by a slit in a partition in a rectangular wave guide. (Report No. 575.) E. S. Akeley. OEMsr-362. Purdue University. March 15, 1945.
- M18** Wave guides without metal walls. (Report No. 726.) R. M. Whitmer. OEMsr-262. MIT, Radiation Laboratory. May 10, 1945.
- M19** A new and practical method for matching two obstacles in a wave guide. (Report No. 461.) S. C. Snowdon and D. W. Hagelbarger. OEMsr-1311. California Institute of Technology. July, 1945.
- M20** An improved K-band vertebrae wave guide. (Report No. 776.) E. L. Younker. OEMsr-262; Service Project No. AN-25. MIT, Radiation Laboratory. August 25, 1945.
- M21** Dielectric phase shifters for wave guide. (Report No. 788.) Francis T. Worrell. OEMsr-262. MIT, Radiation Laboratory. September 14, 1945.
- M22** [A] 3-cm vertebrae flexible wave guide. (Report No. 831.) Francis T. Worrell. OEMsr-262. MIT, Radiation Laboratory. October 10, 1945.
- M23** Flexible wave guides. (Report No. 832.) Francis T. Worrell. OEMsr-262. MIT, Radiation Laboratory. October 19, 1945.
- M24** A microwave band-pass filter in wave guide. (Report No. 814.) H. A. Leiter. OEMsr-262. MIT, Radiation Laboratory. November 16, 1945.
- M25** Characteristics of horn feeds on rectangular wave guide. (Report No. 656.) J. R. Risser. OEMsr-262. MIT, Radiation Laboratory. December 28, 1945.
- M26** Admittance characteristics of some S-band wave guide fed dipoles. (Report No. 1082.) Jabez Whelpton. OEMsr-262. MIT, Radiation Laboratory. January 24, 1946.
- M27** [A] K-band echo line. (Report No. 974.) J. M. Wolf. OEMsr-262. MIT, Radiation Laboratory. March 26, 1946.
- 233.413 Coaxial**
- M1** Design data for 50-ohm rigid coaxial line. (Report No. 147.) (n.a.) MIT, Radiation Laboratory. December 5, 1941.
- M2** Tests on undercut beads in a concentric line. (Report No. 152.) M. G. White. MIT, Radiation Laboratory. January 30, 1942.
- M3** Junction effect of two unequal matched coaxial lines. (Report No. 123.) Ernst Weber. Polytechnic Institute of Brooklyn. September 16, 1942.
- M4** The measurement of dielectric constant and loss with standing waves in coaxial wave guides. (Report No. 142.) Arthur R. von Hippel, D. G. Jelatis and W. B. Westphal. OEMsr-191. MIT, Laboratory for Insulation Research. April, 1943.
- M5** A method of measuring the S-band characteristic impedance of coaxial cable. (Report No. 252.) F. Edward Ehlers. MIT, Radiation Laboratory. April 28, 1943.
- M6** Lossless coaxial exponential tapers. (Report No. 164.) Edward Peskin and Ernst Weber. Polytechnic Institute of Brooklyn. May 20, 1943.
- M7** Development of a high-impedance radio frequency transmission line. (Report No. 424.) Edited by: B. H. Maddock. OEMsr-1283. Federal Telephone and Radio Corporation. January 13, 1945.
- M8** Broad-band coaxial line horn. (Report No. 770.) Jack Steinberger. OEMsr-262. MIT, Radiation Laboratory. July 20, 1945.
- M9** [An] S-band coaxial line to rectangular wave guide transitions. (Report No. 802.) F. L. Nieman. OEMsr-262. MIT, Radiation Laboratory. December 7, 1945.
- M10** Absorption coefficient of a styraloy-filled coaxial line. (Report No. 827.) Howard J. Rowland. OEMsr-262. MIT, Radiation Laboratory. March 4, 1946.
- M11** Design and test of concentric transmission lines. (Report No. 141.) James L. Lawson. MIT, Radiation Laboratory. (n.d.)
- 233.42 Accessories**
- 233.421 Stubs**
- M1** Stub supports in 7/8-inch coaxial lines. (Report No. 232.) R. V. Pound. MIT, Radiation Laboratory. May 19, 1942.

- M2 Phase distortion in broad-band stub supports. (Report No. 237.) R. V. Pound. MIT, Radiation Laboratory. August 17, 1942.
- M3 Rotary joints with E_0 stub transformers. (Report No. 243.) W. M. Preston. MIT, Radiation Laboratory. December 18, 1942.
- M4 An experimental $5/8$ -inch universal stub. (Report No. 221.) John E. Ebert and John W. E. Griemsmann. OEMsr-335. Polytechnic Institute of Brooklyn. July 1, 1943.

233.422 Couplings and Bends

- M1 Junction effects in wave guides. (Part I. Report No. 124.) N. H. Frank. MIT, Radiation Laboratory. November, 1941.
- M2 T-junctions in rectangular wave guides. Part II, Final formulae and curves. (Report No. 180.) L. J. Chu and N. H. Frank. MIT, Radiation Laboratory. July 19, 1942.
- M3 T-junctions in rectangular wave guides. Part I, Theory. (Report No. 179.) N. H. Frank and L. J. Chu. MIT, Radiation Laboratory. July 27, 1942.
- M4 Losses and reflections introduced by joints and plungers in 3-cm wave guides. (Report No. 164.) C. G. Montgomery and Dorothy D. Montgomery. MIT, Radiation Laboratory. October 15, 1942.
- M5 Wave guide handbook. Section IV, Bends and T-junctions in wave guides. (Report No. T-9.) N. H. Frank. MIT, Radiation Laboratory. December 4, 1942.
- M6 Coupling between inductive windows in wave guide. (Report No. 197.) N. H. Frank. MIT, Radiation Laboratory. February 27, 1943.
- M7 Capacity (choke) couplings as rigid and non-rigid wave guide connectors. (Report No. 255.) John C. Reed, George L. Ragan and others. MIT, Radiation Laboratory. August 27, 1943.
- M8 Instruction manual for installation of Chiksan Tool Company, $1\frac{5}{8}$ -inch revolving joint (Drawing No. 61D1C) on Radiation Laboratory Types B-1 and B-2 cable, Army-Navy Types RG-27/U and RG-28/U. (Report No. M-154.) R. R. Steinke. OEMsr-262. MIT, Radiation Laboratory. January 22, 1944.
- M9 Walworth wave guide bends. (Report No. S-3.) Richard M. Walker. OEMsr-262. MIT, Radiation Laboratory. January 28, 1944.
- M10 Performance of coupling for $1\frac{1}{2}$ -inch x 3-inch wave guide. (Report No. 538.) H. F. Webster. OEMsr-262. MIT, Radiation Laboratory. March 6, 1944.
- M11 Corners, bends and twists in rectangular wave guide. (Report No. 585.) Richard M. Walker. OEMsr-262. MIT, Radiation Laboratory. July 6, 1944.
- M12 Tests on additional modified Type N connectors. (Report No. 472.) John W. E. Griemsmann and Leo Nadler. OEMsr-335. Polytechnic Institute of Brooklyn. March 21, 1945.
- M13 Parallel plate bends. (Report No. 760.) M. A.

Taggart and E. C. Fine. OEMsr-262. MIT, Radiation Laboratory. September 5, 1945.

- M14 Type N connector design and tests. (Report No. 530.) (n.a.) OEMsr-335. Polytechnic Institute of Brooklyn. October 31, 1945.
- M15 E_0 rotary joints for the 3-centimeter band. (Report No. 853.) F. Edward Ehlers. OEMsr-262. MIT, Radiation Laboratory. December 4, 1945.
- M16 Theory of directional couplers. (Report No. 860.) B. A. Lippmann. OEMsr-262. MIT, Radiation Laboratory. December 28, 1945.
- M17 Design considerations for directional couplers. (Report No. 724.) R. J. Harrison. OEMsr-262. MIT, Radiation Laboratory. December 31, 1945.
- M18 A theory of resonance in rotary joints of the TM_{01} type. (Report No. 993.) H. K. Farr. OEMsr-262. MIT, Radiation Laboratory. January 15, 1946.
- M19 Wave guide motional joints. (Report No. 1037.) Walter Aron. OEMsr-262. MIT, Radiation Laboratory. January 18, 1946.

233.423 Discontinuities (Irises, Windows, Etc.)

- M1 The susceptance of asymmetrically located windows in rectangular wave guides. (Report No. 183.) A. E. Heins. MIT, Radiation Laboratory. October 16, 1942.
- M2 Transmission of irises in wave guides. (Report No. 111.) H. A. Bethe, Julian Schwinger and others. OEMsr-429. Cornell University. November 3, 1942.
- M3 Lumped constants for small irises. (Report No. 194.) H. A. Bethe. MIT, Radiation Laboratory. March 24, 1943.
- M4 Theory of side windows in wave guides. (Report No. 199.) H. A. Bethe. MIT, Radiation Laboratory. April 4, 1943.
- M5 One-sided inductive irises and quarter-wave capacitive transformers in wave guide. (Report No. 426.) William Sichak. MIT, Radiation Laboratory. November 17, 1943.
- M6 Theory of thick inductive windows with small openings. (Report No. 171.) W. A. Bowers, Henry Hurwitz, Jr. and H. Levine. OEMsr-429. Cornell University. November 26, 1943.
- M7 Dielectric windows in wave guide. (Report No. 587.) Richard M. Walker. OEMsr-262. MIT, Radiation Laboratory. June 29, 1944.
- M8 A new method for the precision measurement of wave guide discontinuities. (Report No. 317.) W. H. Pickering, D. W. Hagelbarger and others. OEMsr-1311. California Institute of Technology. October, 1944.
- M9 Mica windows for wave guide output magnetrons. (Report No. 366.) L. Malter, R. L. Jepsen and L. R. Bloom. OEMsr-1043. Radio Corporation of America. December 5, 1944.
- M10 Precision measurement of wave guide discontinuities. (Report No. 460 and Supplement.) W. H.

Pickering, S. C. Snowdon and D. W. Hagelbarger. OEMsr-1311. California Institute of Technology. July and October, 1945.

M11 Discontinuities in standing wave detectors and wave guide junction steps. (Report No. 893.) Ina G. Mansur. OEMsr-262. MIT, Radiation Laboratory. December 14, 1945.

M12 The interaction of discontinuities on a transmission line. (Report No. 930.) P. M. Marcus. OEMsr-262. MIT, Radiation Laboratory. February 6, 1946.

233.424 Switches

M1 Low-power radio frequency switch. (Report No. 675.) Albert M. Stone. OEMsr-262. MIT, Radiation Laboratory. February 23, 1945.

M2 A low-power X-band radio frequency gas switch. (Report No. 841.) T. S. Kê and L. D. Smullin. OEMsr-262. MIT, Radiation Laboratory. October 19, 1945.

M3 Note on a low-power S-band gas switch. (Report No. 979.) T. S. Kê. OEMsr-262. MIT, Radiation Laboratory. December 10, 1945.

233.43 General Transmission Line Problem

M1 Elimination of the trombone between transmitter and junction in a duplexing system. (Report No. 345.) James L. Lawson. MIT, Radiation Laboratory. May 4, 1942.

M2 Transmission line construction details. (Report No. 231.) A. E. Hayes, Jr. MIT, Radiation Laboratory. May 14, 1942.

M3 Introduction to alternating currents, Q values and transmission lines. (Report No. T-17.) E. W. Samson. OEMsr-262. MIT, Radiation Laboratory. August 29, 1944.

233.5 Radio Frequency System Tests

M1 Tune-up procedure for 3-cm radio frequency system. (Report No. 160.) W. M. Preston. MIT, Radiation Laboratory. May 25, 1942.

M2 Matching radio frequency losses and frequency sensitivity of a 3-cm radio frequency system. (Report No. 161.) W. M. Preston. MIT, Radiation Laboratory. May 25, 1942.

M3 [Some] X-band measurements at low pressure. (Report No. 250.) T. S. Saad. MIT, Radiation Laboratory. May 18, 1943.

234 Antennas and Mounts

M1 Report of the Antenna Group. (Report Nos. 94 to 97.) (n.a.) MIT, Radiation Laboratory. February 14, March 12, May 1 and July 1, 1941.

M2 Preliminary testing of the Houston Corporation AN/APS-10 scanner. (Report No. S-33.) G. E. Hewitt. OEMsr-262. MIT, Radiation Laboratory. December 23, 1944.

234.1 Types

234.11 Experimental

234.111 S-Band

M1 [Some] S-band horizontally polarized non-directional antennas. (Report No. 517.) Henry J. Riblet. OEMsr-262. MIT, Radiation Laboratory. February 14, 1944.

M2 [An] S-band end-fire array antenna. (Report No. 577.) Henry J. Riblet and B. L. Birchard. OEMsr-262; Service Project Nos. SC-57 and SC-103. MIT, Radiation Laboratory. July 11, 1944.

M3 [Some] S-band vertically polarized non-directional antennas. (Report No. 623.) Henry J. Riblet. OEMsr-262. MIT, Radiation Laboratory. December 20, 1944.

M4 Streamlined microwave omnidirectional antennas. (Report No. 871.) C. B. Barker and Henry J. Riblet. OEMsr-262. MIT, Radiation Laboratory. January 8, 1945.

M5 A low-drag beacon antenna for fighter aircraft. (Report No. 685.) A. S. Dunbar and M. E. van Valkenburg. OEMsr-262; Service Project Nos. AC-263.07 and SC-63.04. MIT, Radiation Laboratory. April 28, 1945.

M6 Shipboard Black Maria antennas. (Report No. 796.) Edgar N. Gilbert and Henry J. Riblet. OEMsr-262; Service Project No. NA-178. MIT, Radiation Laboratory. October 15, 1945.

M7 [An] S_A 6-6 horizontally polarized antenna. (Report No. 823.) A. B. Dickinson. OEMsr-262; Service Project No. SC-63.04. MIT, Radiation Laboratory. November 30, 1945.

M8 Two circularly polarized S-band horns. (Report No. 980.) Dora F. Sherman. OEMsr-262. MIT, Radiation Laboratory. January 15, 1946.

M9 Airborne Black Maria antenna. (Report No. 866.) Edgar N. Gilbert. OEMsr-262. MIT, Radiation Laboratory. January 16, 1946.

M10 Ship-controlled interception search antenna, Mark II. (Report No. 1026.) M. L. Kales. OEMsr-262. MIT, Radiation Laboratory. February 20, 1946.

M11 Ship-controlled interception search antenna, Mark I. (Report No. 1025.) M. L. Kales. OEMsr-262. MIT, Radiation Laboratory. March 13, 1946.

234.112 X-Band

M1 [Some] X-band horizontally polarized non-directional antennas. (Report No. 489.) Henry J. Riblet. OEMsr-262; Service Project Nos. SC-63.03 and NS-126. MIT, Radiation Laboratory. April 22, 1944.

M2 [The] BUPX antenna, Type A. (Report No. 396.) J. Epstein. OEMsr-684. Radio Corporation of America. July 21, 1944.

M3 [The] SU-2 antenna. Line of sight stabilization of a radar beam by reflector tilt. (Report No. 660.) J. I. Bohnert and T. J. Keary. OEMsr-262; Service Project No. NS-175. MIT, Radiation Laboratory. February 19, 1945.

M4 [The] SU-2 antenna. Shipborne stabilized radar

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antenna for sea search. (Report No. 659.) T. J. Keary and J. I. Bohnert. OEMsr-262; Service Project No. NS-175. MIT, Radiation Laboratory. March 7, 1945.

- M5** An X-band hemi-isotropic radiator. (Report No. 981.) Dora F. Sherman. OEMsr-262. MIT, Radiation Laboratory. January 10, 1946.
- M6** Omnidirectional antennas for BUPX. (Report No. 996.) Leonard J. Eyges. OEMsr-262. MIT, Radiation Laboratory. January 17, 1946.
- M7** The antenna for radar Mark 35. (Report No. 1045.) L. E. Swarts. OEMsr-262. MIT, Radiation Laboratory. January 29, 1946.
- M8** Double coaxial coupler for BUPX antenna. (Report No. 736.) R. M. Fano. OEMsr-262; Service Project Nos. SC-63.05 and NA-163. MIT, Radiation Laboratory. (n.d.)

234.113 K-Band

- M1** [Some] K-band cosec² antennas with a line source and shaped cylindrical reflector. (Report No. 624.) William Sichak and E. M. Purcell. OEMsr-262; Service Project No. AN-25. MIT, Radiation Laboratory. November 3, 1944.
- M2** [The] Cindy antenna. A high resolution K-band radar antenna for sea search. (Report No. 849.) J. I. Bohnert. OEMsr-262; Service Project No. NS-234. MIT, Radiation Laboratory. November 1, 1945.
- M3** [The] AN/APS-32 and AN/APS-34 airborne navigational radar antennas at K-band. (Report No. 808.) T. J. Keary, A. R. Poole and others. OEMsr-262; Service Project Nos. AN-21 and NS-314. MIT, Radiation Laboratory. March 15, 1946.

234.12 Radar Systems

234.121 Ship

- M1** Development of antenna for Raytheon SO-CXBY. (Report No. 396.) D. L. Jaffee. MIT, Radiation Laboratory. February 25, 1943.
- M2** Vertical coverage of a 1½' x 5' antenna designed for SG-3. (Report No. 636.) C. E. Moore and R. W. Blue. MIT, Radiation Laboratory. December 7, 1944.
- M3** [The] SG-1 antenna, Mark 2. (Report No. 639.) R. W. Thickers. OEMsr-262. MIT, Radiation Laboratory. January 9, 1945.
- M4** Stabilized SG-3 antenna. (Report No. 665.) J. I. Bohnert and H. Krutter. Service Project No. NS-175. MIT, Radiation Laboratory. February 7, 1945.
- M5** The ship-controlled interception rapid scan height finding antenna. (Report No. 688.) Charles V. Robinson, M. A. Taggart and M. D. Pearson. OEMsr-262; Service Project Nos. NS-194 and NS-363. MIT, Radiation Laboratory. July 9, 1945.
- M6** [The] SG-1, Mark III antenna. (Report No. 1044.)

S. J. Mason. OEMsr-262. MIT, Radiation Laboratory. March 5, 1946.

234.122 Air

- M1** Pictorial brief of an experimental AGL-1 installation. (Report No. 377.) Charles F. West, L. Jackson Laslett and George W. Curran. MIT, Radiation Laboratory. [May 10, 1943.]
- M2** LRASV, [the] AN/APA-2, antenna. (Report No. 415.) Louise Buchwalter and G. G. Harvey. MIT, Radiation Laboratory. October 13, 1943.
- M3** Rotating corrugated eccentric line antennas. (Report No. 531.) Louise Buchwalter. OEMsr-262; Service Project Nos. SC-45 and SC-46. MIT, Radiation Laboratory. June 13, 1944.
- M4** Scanning antenna for the Eagle precision radar bombsight, AN/APQ-7. (Report No. 312.) G. T. Lorange. OEMsr-1089. International Projector Corporation. August 11, 1944.
- M5** Low-altitude navigation antennas developed in connection with AN/APS-10. (Report No. 615.) J. H. Gardner. OEMsr-262; Service Project No. SC-46. MIT, Radiation Laboratory. October 3, 1944.
- M6** [The] APQ-13 60-inch antenna. (Report No. 751.) William Sichak. OEMsr-262; Service Project No. AC-232.02. MIT, Radiation Laboratory. August 1, 1945.
- M7** The AN/APQ-13 60-inch scanner in B-29 airplanes. (Report No. 848.) Willoughby M. Cady, F. J. Mehringer and William Sichak. OEMsr-262; Service Project No. AC-232.02. MIT, Radiation Laboratory. October 29, 1945.
- M8** Hawkeye antenna. Airborne high-resolution antenna for sea search of submarine Schnorkel. (Report No. 812.) C. B. Stanley. OEMsr-262. MIT, Radiation Laboratory. October 30, 1945.
- M9** [An] IFF receiving antenna for mounting in Cadillac dish. (Report No. 843.) Ingo Maddaus, Jr. OEMsr-262; Service Project No. NA-178. MIT, Radiation Laboratory. November 26, 1945.
- M10** Airborne early warning Block III relay antenna. (Report No. 845.) Ingo Maddaus, Jr. OEMsr-262; Service Project No. NA-178. MIT, Radiation Laboratory. November 30, 1945.
- M11** [An] IFF antenna for mounting on the wing of a TBM torpedo bomber. (Report No. 842.) Ingo Maddaus, Jr. OEMsr-262. MIT, Radiation Laboratory. December 6, 1945.
- M12** [An] IFF transmitting antenna for mounting in Cadillac dish. (Report No. 844.) Ingo Maddaus, Jr. OEMsr-262. MIT, Radiation Laboratory. December 14, 1945.
- M13** The AN/APS-23 antenna and installation. (Report No. 878.) Willoughby M. Cady. OEMsr-262; Service Project Nos. AC-232.10, AC-232.03 and AN-24. MIT, Radiation Laboratory. January 10, 1946.
- M14** [The] APS-33 antenna. Final pre-production data.

(Report No. 861.) L. G. Jones. OEMsr-262. MIT, Radiation Laboratory. January 11, 1946.

M15 Low altitude $\text{csc}^2\theta$ antenna for APS-33 project. (Report No. 1073.) J. H. Gardner. OEMsr-262. MIT, Radiation Laboratory. February 21, 1946.

M16 [The] AN/APS-31 antenna. (Report No. 1068.) M. Berman. OEMsr-262. MIT, Radiation Laboratory. February 26, 1946.

M17 Linear array for use in the AN/APS-23 antenna. (Report No. 973.) J. R. Risser, A. M. Steenland and others. OEMsr-262; Service Project No. AC-232.02. MIT, Radiation Laboratory. March 19, 1946.

M18 Boresighting the AN/APG-15 antenna assembly. (Report No. 1009.) Charles F. Chubb, Jr. OEMsr-262. MIT, Radiation Laboratory. April 23, 1946.

234.123 Ground

M1 Electrical design of the AN/TPS-10 antenna. (Report No. 648.) C. S. Pao. OEMsr-262; Service Project No. SC-107. MIT, Radiation Laboratory. December 28, 1944.

M2 A simplified search antenna for radio set, AN/MPN-1. (Report No. 486.) C. F. Porterfield and L. J. Chu. OEMsr-262; Service Project Nos. SC-53, SC-72 and NS-239. MIT, Radiation Laboratory. January 1, 1945.

M3 [The] AN/CPS-6, V-beam, antenna. (Report No. 951.) C. G. Stergiopoulos. OEMsr-262. MIT, Radiation Laboratory. February 12, 1946.

M4 The Beavertail, AN/CPS-4, antenna. (Report No. 1027.) C. S. Pao. OEMsr-262. MIT, Radiation Laboratory. April 9, 1946.

234.2 Antenna Factors

234.21 Antenna Feeds

M1 Some matching properties of antenna feeds. (Report No. 261.) H. Krutter, Ralph E. Hiatt and J. I. Bohnert. MIT, Radiation Laboratory. November 17, 1942.

M2 Rear rectangular guide antenna feed. (Report No. 169.) J. S. Foster. MIT, Radiation Laboratory. March 24, 1943.

M3 Illumination and phases of antenna feeds. (Report No. 170.) J. S. Foster. MIT, Radiation Laboratory. March 29, 1943.

M4 Round guide rear antenna feeds. (Report No. 171.) J. S. Foster. MIT, Radiation Laboratory. April 28, 1943.

M5 Antenna feeds for $7/8$ -inch stub-supported coaxial line. (Report No. 271.) Stanley Breen and Ralph E. Hiatt. MIT, Radiation Laboratory. June 21, 1943.

M6 Antenna feeds from $5/16$ -inch coaxial line. (Report No. 274.) W. B. Nowak. MIT, Radiation Laboratory. July 5, 1943.

M7 Paraboloid antenna characteristics as a function of feed tilt. (Report No. 479.) Samuel Silver and

C. S. Pao. OEMsr-262. MIT, Radiation Laboratory. February 16, 1944.

M8 Flight test of an experimental horn-fed antenna for H_2X . (Report No. 91.3.) R. C. Ottens and J. E. Woodward. MIT, Radiation Laboratory. December 1, 1944.

M9 Shaping the primary pattern of a horn feed. (Report No. 655.) C. S. Pao. OEMsr-262. MIT, Radiation Laboratory. January 22, 1945.

M10 Primary feeds in cylindrical parabolas. (Report No. 686.) G. J. Yevick. OEMsr-262. MIT, Radiation Laboratory. April 23, 1945.

M11 Horn with metal lens. (Report No. 863.) M. A. Taggart. OEMsr-262. MIT, Radiation Laboratory. November 13, 1945.

M12 Horn feeds for parabolic antennas. (Report No. 690.) S. J. Mason. OEMsr-262. MIT, Radiation Laboratory. January 22, 1946.

M13 A four-horn feed to give csc^2 antenna patterns. (Report No. 896.) William J. West. OEMsr-262. MIT, Radiation Laboratory. March 15, 1946.

M14 An IFF Mark 5/UNB feed in the ship-controlled interception search antenna. (Report No. 897.) William J. West. OEMsr-262. MIT, Radiation Laboratory. March 26, 1946.

M15 An IFF Mark 5/UNB feed in the AN/CPS-6 vertical antenna. (Report No. 898.) William J. West. OEMsr-262; Service Project No. AC-239.05. MIT, Radiation Laboratory. April 10, 1946.

234.22 Antenna Design

M1 Notes on antenna design. (Report No. 123.) J. A. Stratton and L. J. Chu. MIT, Radiation Laboratory. October 21, 1941.

M2 Design of a perpendicular dipole antenna for feeding paraboloids, and patterns obtained under standard conditions. (Report No. 98.) L. C. Van Atta. MIT, Radiation Laboratory. January 6, 1942.

M3 Paraboloid diffraction patterns from the standpoint of physical optics. (Report No. T-7.) R. C. Spencer. MIT, Radiation Laboratory. October 21, 1942.

M4 Gratings and screens as microwave reflectors. (Report No. 268.) (n.a.) MIT, Radiation Laboratory. April 1, 1943.

M5 Synthesis of microwave diffraction patterns with application to $\text{csc}^2\theta$ patterns. (Report No. 272.) R. C. Spencer. MIT, Radiation Laboratory. June 23, 1943.

M6 [A] 45° microwave reflector. (Report No. 267.) S. J. Mason. MIT, Radiation Laboratory. November 19, 1943.

M7 Analysis and correction of the impedance mismatch due to a reflector. (Report No. 810.) Samuel Silver. OEMsr-262. MIT, Radiation Laboratory. September 25, 1945.

M8 A flat plate beam-shaping antenna. (Report No. 903.) W. O. Smith. OEMsr-262. MIT, Radiation Laboratory. January 15, 1946.

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- M9** Quarter-wave plate for broad-band circular polarization. (Report No. 769.) J. E. Eaton and Jack Steinberger. OEMsr-262. MIT, Radiation Laboratory. January 28, 1946.
- M10** Metal plate lens for csc² antenna. (Report No. 1070.) A. S. Dunbar. OEMsr-262. MIT, Radiation Laboratory. February 15, 1946.
- M11** The alteration in the radiated field of a paraboloid due to a shift in the position of the dipole feed. (Report No. 1078.) F. B. Hildebrand. OEMsr-262. MIT, Radiation Laboratory. February 20, 1946.
- M12** Dipole arrays backed by reflecting sheets. (Report No. 1014.) Dora F. Sherman. OEMsr-262. MIT, Radiation Laboratory. March 18, 1946.
- 234.23 Antenna Parts**
- M1** Antenna parts and measuring equipment. (Report No. 472.) T. W. Lashof. MIT, Radiation Laboratory. November 5, 1943.
- 234.231 Paraboloid Reflectors**
- M1** Effect of paraboloid size and shape on beam patterns. (Report No. 258.) L. C. Van Atta. MIT, Radiation Laboratory. August 5, 1942.
- M2** Information of standard Radiation Laboratory paraboloid reflectors. (Report No. 269.) L. C. Van Atta and Charles V. Robinson. MIT, Radiation Laboratory. March 3, 1943.
- M3** Information on Radiation Laboratory paraboloid reflectors. (Report No. 679.) T. W. Lashof. OEMsr-262. MIT, Radiation Laboratory. January 23, 1945.
- 234.232 Linear Rays**
- M1** Probe fed slots as radiating elements in linear arrays. (Report No. 455.) Roger E. Clapp. OEMsr-262. MIT, Radiation Laboratory. January 25, 1944.
- M2** [A] K-band high-power water load. (Report No. 723.) Richard M. Walker. OEMsr-262; Service Project No. AN-25. MIT, Radiation Laboratory. May 10, 1945.
- M3** [A] K-band linear array. (Report No. 771.) Jack Steinberger and E. B. Chisholm. OEMsr-262. MIT, Radiation Laboratory. January 31, 1946.
- 234.233 Pillboxes**
- M1** A new pillbox feed. (Report No. 862.) M. A. Taggart. OEMsr-262. MIT, Radiation Laboratory. November 7, 1945.
- M2** A broad-band TEM pillbox. (Report No. 901.) W. O. Smith. OEMsr-262. MIT, Radiation Laboratory. January 11, 1946.
- M3** Lens feed for K-band pillboxes. (Report No. 869.) Leonard J. Eyges. OEMsr-262. MIT, Radiation Laboratory. January 23, 1946.
- 234.3 Scanning**
- 234.31 Theoretical Research**
- M1** Search scans and system performance. (Report No. 407.) Willoughby M. Cady. MIT, Radiation Laboratory. August 9, 1943.
- M2** Stable scanners and unsteady airplanes. (Report No. 701.) Willoughby M. Cady. OEMsr-262. MIT, Radiation Laboratory. February 21, 1945.
- 234.32 Units and Systems**
- 234.321 Conical Scanning**
- M1** On conical scanning. (Report No. 3.) (n.a.) MIT, Radiation Laboratory. March 24, 1941.
- M2** Conical scanning. (Report No. 367.) Ralph S. Phillips. MIT, Radiation Laboratory. August 4, 1942.
- M3** Calculation of errors in conical scanning GL systems arising from detuning when the transmitter frequency is pulled during the rotation. L. Jackson Laslett. MIT, Radiation Laboratory. [March, 1943.]
- 234.322 Rapid Scanning**
- M1** Rapid scanning high-resolution antennas. (Report No. 265.) Charles V. Robinson. MIT, Radiation Laboratory. February 15, 1943.
- M2** Conference on rapid scanning. (Report No. 275.) G. G. Harvey. MIT, Radiation Laboratory. June 15, 1943.
- M3** Leaky wave guide rapid scanner. (Report No. 557.) Jack Steinberger. OEMsr-262. MIT, Radiation Laboratory. November 18, 1944.
- M4** Mechanical resonant scanner. (Report No. 782.) D. B. Nicholson, R. Sher and C. Schultz. OEMsr-262. MIT, Radiation Laboratory. March 13, 1946.
- M5** [A] K-band rapid scan. (Report No. 960.) C. J. Swartwout. OEMsr-262. MIT, Radiation Laboratory. March 15, 1946.
- M6** Operating instructions for the K-band rapid scan system. (Report No. M-248.) C. J. Swartwout. OEMsr-262. MIT, Radiation Laboratory. March 20, 1946.
- 234.323 AN/APG (-5 and -21) and AN/APS (-6 and -10)**
- M1** The AIA-1 scanner development program. (Report No. 199.) T. I. Moseley. OEMsr-960. Dalmo Victor, Inc. February 3, 1944.
- M2** [The] AIA-1 scanner development program. (Report No. 321.) T. I. Moseley. OEMsr-960. Dalmo Victor, Inc. August 14, 1944.
- M3** Radar scanner development program. (Report Nos. 361, 418 and 419 [for the period] July 1, 1944 to January 1, 1945.) T. I. Moseley. OEMsr-960. Dalmo Victor, Inc. September 30 and December 30, 1944 and January 12, 1945.
- M4** Mechanical and electrical tests of the General Electric Company scanner for the AN/APS-10 system. (Report No. S-61.) G. E. Hewitt. OEMsr-

262; Service Project Nos. SC-46 and AC-234.01. MIT, Radiation Laboratory. July 14, 1945.

234.324 Electrical

- M1** Parallel plate optics for electrical scanning. (Report No. 646.) S. B. Meyers. OEMsr-262. MIT, Radiation Laboratory. December 16, 1944.
- M2** Linear electrical scanner. (Report No. 635.) J. S. Foster. OEMsr-262. MIT, Radiation Laboratory. January 6, 1945.

234.325 Spiral

- M1** The balancing of spiral-scan spinners. (Report No. 380.) Willoughby M. Cady. MIT, Radiation Laboratory. September 9, 1942.
- M2** Altitude return in the AN/APS-6. (Report No. 706.) Eugene W. Cowan, Jr. OEMsr-262; Service Project Nos. NA-125 and NS-171. MIT, Radiation Laboratory. March 26, 1945.
- M3** Sea return effects and their elimination in the AN/APS-6. (Report No. 707.) Eugene W. Cowan, Jr. OEMsr-262; Service Project No. NS-171. MIT, Radiation Laboratory. June 11, 1945.
- M4** Radar scanning unit. (Report No. 566.) O. W. Schotz. OEMsr-1167. Chrysler Corporation. October 25, 1945.
- M5** Radar nutating antenna spiral scanning units. Balance and adjustment. (Report No. 573.) R. Halberg and S. T. Foresman. Chrysler Corporation. November 27, 1945.

234.326 Miscellaneous Scanner Systems and Units

- M1** A study of fanned beam radiators. (Report No. 99.) (n.a.) MIT, Radiation Laboratory. February 20, 1942.
- M2** Precision aircraft scanners. (Report No. 410.) R. W. Porter. OEMsr-540. General Electric Company. January 1, 1944.
- M3** [The] H2K roll stabilized scanner. (Report No. 429.) (n.a.) OEMsr-1291. Maguire Industries, Inc. April, 1945.
- M4** Proposed antenna for panoramic radar. (Report No. S-55.) Walter O. Gordy. OEMsr-262. MIT, Radiation Laboratory. May 22, 1945.
- M5** Mortar fire detection. (Report No. 1064.) Harvey R. Worthington, Jr. OEMsr-262. MIT, Radiation Laboratory. April 10, 1946.
- M6** Survey of Foster scanner developments. (Report No. 1074.) Walter E. Millett, Harvey R. Worthington, Jr. and others. OEMsr-262. MIT, Radiation Laboratory. April 25, 1946.
- M7** Variable-width wave guide scanners for Eagle, AN/APQ-7, and ground-controlled approach, AN/MPN-1. (Report No. 840.) Randal McG. Robertson. OEMsr-262; Service Project Nos. AC-1 and SC-53. MIT, Radiation Laboratory. April 30, 1946.

234.33 Miscellaneous Scanning Problems

- M1** Correction of the scanning of shipborne radar

systems for roll and pitch of the ship. (Report No. 126.) Hubert M. James. MIT, Radiation Laboratory. December 22, 1941.

- M2** Laboratory and field tests with stabilized spinners. (Report No. 395.) R. W. Griffiths. MIT, Radiation Laboratory. April 21, 1943.
- M3** Automatic range and azimuth tracking while scanning. (Report No. 341.) A. B. Jacobsen, F. P. Coffin and W. B. Jones, Jr. MIT, Radiation Laboratory. August 30, 1943.
- M4** RASD stable element. (Report No. 567.) R. J. Johnson. OEMsr-1336. General Electric Company. October 30, 1945.
- M5** The storage of video signals on simple mosaics. (Report No. 743.) Robert A. McConnell. OEMsr-262. MIT, Radiation Laboratory. February 18, 1946.

234.4 Antenna Measurements

- M1** Graphical analysis of beam patterns from paraboloid reflectors. (Report No. 259.) S. G. Sydoriak and L. C. Van Atta. MIT, Radiation Laboratory. June 11, 1942.
- M2** A method for measuring the absolute gain of microwave antennas. (Report No. 168.) E. M. Purcell. MIT, Radiation Laboratory. January 3, 1943.
- M3** An automatic recorder for microwave antenna pattern measurements. (Report No. 266.) T. J. Keary and R. E. Alley, Jr. MIT, Radiation Laboratory. March 1, 1943.
- M4** Antenna measuring equipment. [A] 100-db linear audio amplifier. (Report No. 601-3.) Owen A. Tyson. OEMsr-262. MIT, Radiation Laboratory. August 23, 1944.
- M5** Antenna measuring equipment. High-power continuous wave transmitter for S-band. (Report No. 601-2.) Owen A. Tyson. OEMsr-262. MIT, Radiation Laboratory. August 24, 1944.
- M6** Antenna measuring equipment. (Report No. 601-1.) Owen A. Tyson. OEMsr-262. MIT, Radiation Laboratory. October 6, 1944.
- M7** Antenna measuring equipment. Automatic antenna pattern recorder. (Report No. 601-4.) Owen A. Tyson. OEMsr-262. MIT, Radiation Laboratory. January 16, 1945.
- M8** Field station for antenna measurements. (Report No. 632.) Ralph E. Hiatt. OEMsr-262. MIT, Radiation Laboratory. February 26, 1945.
- M9** Calculation of vertical polar diagrams and power gains of antennas for airborne navigational radars. (Report No. 750.) T. J. Keary. OEMsr-262; Service Project Nos. AC-232.02, AN-21 and NS-314. MIT, Radiation Laboratory. September 10, 1945.
- M10** Measurement of phase in microwave antenna fields by phase modulation method. (Report No. 966.) Harvey R. Worthington, Jr. MIT, Radiation Laboratory. March 14, 1946.

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234.5 Radomes

- M1** [Radomes.] (Report No. 483. Radome Bulletin No. 1.) E. B. McMillan. MIT, Radiation Laboratory. December 2, 1943.
- M2** An outline of the electrical properties of radomes. (Report No. 483. Radome Bulletin No. 2.) Raymond M. Redheffer. MIT, Radiation Laboratory. December 20, 1943
- M3** Ice formation on shipborne radomes. (Report No. 483. Radome Bulletin No. 3.) J. S. White. OEMsr-262. MIT, Radiation Laboratory. February 15, 1944.
- M4** Transmission and reflection of single plane sheets. (Report No. 483. Radome Bulletin No. 4.) Raymond M. Redheffer. OEMsr-262. MIT, Radiation Laboratory. July 12, 1944.
- M5** Recent dielectric constant and loss tangent measurements. (Report No. 483. Radome Bulletin No. 5.) Elizabeth M. Everhart. OEMsr-262. MIT, Radiation Laboratory. July 14, 1944.
- M6** Radomes and system performance. (Report No. 483. Radome Bulletin No. 6.) Raymond M. Redheffer. OEMsr-262. MIT, Radiation Laboratory. November 17, 1944.
- M7** The measurement of high reflections at low power. (Report No. 483. Radome Bulletin No. 7.) Raymond M. Redheffer. OEMsr-262. MIT, Radiation Laboratory. November 20, 1944.
- M8** X-band sandwiches at variable angles of incidence. (Report No. 483. Radome Bulletin No. 8.) Elizabeth M. Everhart. OEMsr-262. MIT, Radiation Laboratory. December 19, 1944.
- M9** The matching of high-standing wave ratios. (Report No. 483. Radome Bulletin No. 9.) Raymond M. Redheffer. OEMsr-262. MIT, Radiation Laboratory. December 22, 1944.
- M10** Transmission and reflection of parallel plane sheets. (Report No. 483. Radome Bulletin No. 12.) Raymond M. Redheffer. OEMsr-262. MIT, Radiation Laboratory. January 26, 1945.
- M11** Electrical properties of double-wall and sandwich radomes. (Report No. 483. Radome Bulletin No. 11.) Raymond M. Redheffer. OEMsr-262. MIT, Radiation Laboratory. February 1, 1945.
- M12** The measurement of small reflections. (Report No. 483. Radome Bulletin No. 10.) Yael N. Dowker and Raymond M. Redheffer. OEMsr-262. MIT, Radiation Laboratory. February 6, 1945.
- M13** Elliptical polarization produced by streamlined radomes. (Report No. 483. Radome Bulletin No. 13.) Raymond M. Redheffer. OEMsr-262. MIT, Radiation Laboratory. February 12, 1945.
- M14** Some electrical aspects of microwave sandwich radome design. (Report No. 483. Radome Bulletin No. 16.) E. R. Steele. OEMsr-262. MIT, Radiation Laboratory. May 9, 1945.
- M15** The measurement of dielectric constants in the one-centimeter band. (Report No. 483. Radome Bulletin No. 15.) Raymond M. Redheffer and

E. D. Winkler. OEMsr-262. MIT, Radiation Laboratory. May 11, 1945.

- M16** Antenna catalogue. (Report No. S-64.) James J. Brady. MIT, Radiation Laboratory. October 8, 1945.
- M17** Radome wall reflections at variable angles of incidence. (Report No. 483. Radome Bulletin No. 20.) Elizabeth M. Everhart. OEMsr-262. MIT, Radiation Laboratory. January 4, 1946.
- M18** Dielectric constants and loss tangents of radome materials. (Report No. 483. Radome Bulletin No. 25.) T. J. Suen and Elizabeth M. Everhart. OEMsr-262. MIT, Radiation Laboratory. January 11, 1946.
- M19** Electrical test methods for radomes. (Report No. 483. Radome Bulletin No. 26.) H. A. Perry, Jr. OEMsr-262. MIT, Radiation Laboratory. January 11, 1946.
- M20** Transmission of lossy sandwiches. (Report No. 483-22.) Yael N. Dowker. OEMsr-262. MIT, Radiation Laboratory. January 23, 1946.

234.51 Airfoils

- M1** Design and test of Project Eagle airfoil. (Report No. 290.) (n.a.) Douglas Aircraft Company, Inc. February 4, 1944.
- M2** Dielectric rod end-fire antennas close to metal surfaces. (Report No. 969.) J. E. Eaton. OEMsr-262. MIT, Radiation Laboratory. January 23, 1946.

234.52 Design

- M1** Transmission characteristics of suggested airplane nose materials. (Report No. 144.) (n.a.) MIT, Radiation Laboratory. October 21, 1941.
- M2** Design characteristics of spinner housing materials. (Report No. 245.) E. B. McMillan. MIT, Radiation Laboratory. January 12, 1943.
- M3** Current progress on radio frequency research. (Report No. 483. Radome Bulletin No. 17.) Mary Hegarty, Yael N. Dowker and others. OEMsr-262. MIT, Radiation Laboratory. May 10, 1945.

234.6 Miscellaneous Antenna Problems

- M1** Spinners and radiators. (Report No. 56.) R. G. Herb. MIT, Radiation Laboratory. October 15, 1941.
- M2** Spinners and radiators. (Report No. 57.) (n.a.) MIT, Radiation Laboratory. November 26, 1941.
- M3** Microwave linear radiators. (Report No. 366.) Luis W. Alvarez. MIT, Radiation Laboratory. July 31, 1942.
- M4** Pillbox antenna for glide path. (Report No. 260.) Charles V. Robinson. MIT, Radiation Laboratory. November 9, 1942.
- M5** The antenna slide rule, Series L. (Report No. 276.) R. C. Spencer. MIT, Radiation Laboratory. June 3, 1943. (Antenna slide rule attached to report.)
- M6** Contribution of the dish to the impedance of an

antenna. (Report No. 442.) Samuel Silver. MIT, Radiation Laboratory. September 17, 1943.

M7 Die-cast model of the CSB antenna. (Report No. 824.) A. B. Dickinson. OEMsr-262; Service Project Nos. AC-106 and AC-263.07. MIT, Radiation Laboratory. November 30, 1945.

M8 Compact horns intermediate between polyrods and reflectors. (Report No. 961.) Robert E. Dillon and Leonard J. Eyges. OEMsr-262. MIT, Radiation Laboratory. January 31, 1946.

M9 The interaction of microwave antennas with dielectric sheets. (Report No. 483. Radome Bulletin No. 18.) Raymond M. Redheffer. OEMsr-262. MIT, Radiation Laboratory. March 1, 1946.

M10 Double skin-back antenna. (Report No. 852.) Howard J. Rowland. OEMsr-262. MIT, Radiation Laboratory. March 29, 1946.

M11 The angular alignment of radar antennas. (Report No. 950.) E. M. Bailey. OEMsr-262. MIT, Radiation Laboratory. March 29, 1946.

M12 Beam-shaping. (Report No. 1069.) J. Certaine. OEMsr-262. MIT, Radiation Laboratory. April 10, 1946.

235 Power Supplies

M1 An investigation of radio frequency probes. (Report No. 483. Radome Bulletin No. 14.) Yael N. Dowker and Raymond M. Redheffer. OEMsr-262. MIT, Radiation Laboratory. February 6, 1946.

M2 Investigation of power supply requirements as a function of future radar circuit development. (Report No. 134.) M. M. Hubbard. Service Project No. SC-32. MIT, Radiation Laboratory. (n.d.)

235.1 Sources of Power

M1 Buffered multiple-phase box. (Report No. 44.) (n.a.) MIT, Radiation Laboratory. October 9, 1941.

M2 Power supply for airborne radar equipment. The weight of airborne systems as a function of power supply frequency. (Report No. 135.) M. M. Hubbard. Service Project No. SC-33. MIT, Radiation Laboratory. February 11, 1943.

M3 Development of three-phase aircraft alternator. (Report No. 287.) B. E. Wallace. OEMsr-609. Leland Electric Company. September 6, 1943.

M4 Development of a power supply and temperature stabilized oscillator for the battery-operated lodar receiver. (Report No. 203.) Walter Lukas. Emerson Radio and Phonograph Corporation. October 29, 1943.

M5 Stabilized high-voltage supply. (Report No. 565.) E. A. Holmes. OEMsr-262; Service Project Nos. SC-37 and NS-224. MIT, Radiation Laboratory. May 19, 1944.

M6 Wave form analysis. (Report No. 561.) O. Abbiati. OEMsr-262. MIT, Radiation Laboratory. May 29, 1944.

M7 Constancy of EMF's of dry batteries. (Report No.

537.) H. S. Sack. OEMsr-768. Cornell University. October 2, 1945.

M8 Handbook of maintenance instructions for Cadillac II power supply. (Report No. M-245.) W. R. Slaunwhite and R. L. Kellner. OEMsr-262; Service Project No. NA-178. MIT, Radiation Laboratory. October 23, 1945.

235.11 High-Altitude Commutation

M1 Analysis of commutation of direct current machinery at high-altitudes. (Report No. 136.) (n.a.) Service Project No. SC-34. [MIT, Radiation Laboratory.] November 28, 1942.

M2 Simulated high-altitude brush testing equipment. (Report No. 137.) I. E. Ross, Jr. [MIT, Radiation Laboratory.] March 30, 1943.

M3 Clearance for carbon brush investigations. (Report No. 138.) I. E. Ross, Jr. [MIT, Radiation Laboratory.] April 2, 1943.

M4 Analysis of commutation of direct current machinery at high-altitudes. (Report No. 139.) (n.a.) MIT, Radiation Laboratory. April 15, 1943.

M5 Development of electrical brushes through powdered metallurgy. (Report No. 313.) Robert L. Klein and Harold Hirsch. OEMsr-1022. Stevens Institute of Technology. November 30, 1943.

235.2 Regulators

M1 A wide range, high-voltage regulator. (Report No. 149.) (n.a.) MIT, Radiation Laboratory. December 20, 1941.

M2 Thyrite bridge-controlled voltage regulator. (Report No. 525.) Heinz E. Kallmann. OEMsr-262. MIT, Radiation Laboratory. March 9, 1944.

M3 Electronic line voltage stabilizers. (Report No. 1042.) J. M. McBean. OEMsr-262. MIT, Radiation Laboratory. February 7, 1946.

240 Receiver Components

241 Receivers

M1 Receivers. (Report No. 100.) (n.a.) MIT, Radiation Laboratory. December 2, 1940.

M2 Receivers. (Report No. 101.) (n.a.) MIT, Radiation Laboratory. December 20, 1940.

M3 Receivers and transmit-receive boxes. (Report No. 102.) (n.a.) MIT, Radiation Laboratory. February 4, 1941.

M4 Visit of members of Receiver Section to the Bell Telephone Laboratories. (Report No. 105.) (n.a.) MIT, Radiation Laboratory. March 7, 1941.

M5 Receivers, transmit-receive boxes [and] measurements. (Report No. 103.) (n.a.) MIT, Radiation Laboratory. March 28, 1941.

M6 Special report on receivers. (Report No. 106.) (n.a.) MIT, Radiation Laboratory. June 24, 1941.

M7 Receivers. (Report No. 104.) (n.a.) MIT, Radiation Laboratory. August 1, 1941.

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241.1 Theoretical Research

- M1** Signal-to-noise measurements on receivers. (Report No. 108.) Robert F. Bacher. MIT, Radiation Laboratory. September 29, 1941.
- M2** Ideal frequency response of a receiver for square pulses. (Report No. 125.) Hubert M. James. MIT, Radiation Laboratory. November, 1941.
- M3** Conference on standardization of intermediate frequency. (Report No. 283.) Clyde E. Ingalls. MIT, Radiation Laboratory. April 18, 1942.
- M4** Simplified measurement of receiver sensitivities. S-band noise source. (Report No. 443.) Maynard C. Waltz and J. B. H. Kuper. MIT, Radiation Laboratory. September 17, 1943.
- M5** Shielding of microwave receivers against interference at intermediate frequencies. (Report No. 471.) Bruce Cork. OEMsr-262. MIT, Radiation Laboratory. August 8, 1944.
- M6** Receiver noise figures and their measurement. (Report No. 746.) Yardley Beers. OEMsr-262. MIT, Radiation Laboratory. July 2, 1945.

241.2 Experimental Types

- M1** A 10-cm super-regenerative receiver. (Report No. 284.) J. B. H. Kuper. MIT, Radiation Laboratory. May 1, 1942.
- M2** The AGL-1 receiver. (Report No. 275.) J. C. Wight. OEMsr-233. General Electric Company. March 23, 1944.
- M3** [The] AN/APS-15 receiver indicator modified for ground range sweeps and remote amplifier. (Report No. M-172a.) Paul Jarmotz. OEMsr-262. MIT, Radiation Laboratory. October 10, 1944.

241.3 Amplifiers

- M1** Memorandum describing high-gain direct current amplifier. (Report No. M-110.) Wayne B. Nottingham. MIT, Radiation Laboratory. June 3, 1942.
- M2** Externally-triggered circular sweep amplifiers. (Report No. 335.) Paul F. Brown and V. W. Hughes. MIT, Radiation Laboratory. May 6, 1943.
- M3** The Radiation Laboratory S-band amplifier. (Report No. 306.) H. V. Neher. MIT, Radiation Laboratory. July 10, 1943.
- M4** Analysis of the 6SA-7 gated amplifier. (Report No. 158.) J. Kurshan and B. Rossi. OEMsr-768. Cornell University. July 14, 1943.
- M5** Modification of the amplifier of the AN/APN-2 to give sharp cut-off wide band response. (Report No. 613.) Henry Wallman and G. H. Suits. OEMsr-262. MIT, Radiation Laboratory. September 18, 1944.
- M6** Development and use of the microband lock-in amplifier. (Report No. 592.) G. A. Rosselot. OEMsr-344. Georgia School of Technology. September, 1945.
- M7** Some notes on space-charge-limited oscillators and amplifiers at microwave frequencies. (Report No.

822.) H. V. Neher. OEMsr-262. MIT, Radiation Laboratory. November 15, 1945.

- M8** Low-noise replacement preamplifier for the SCR-584 (BC-1408). (Report No. 699.) C. P. Gadsden. OEMsr-262. MIT, Radiation Laboratory. March 1, 1946.

241.31 Video

- M1** Service manual for video amplifier, Moore School Model No. 1. (Report No. 97.) (n.a.) University of Pennsylvania. January 23, 1943.
- M2** Instructions for operation of high-gain video amplifier for P4-E synchroscope. (Report No. M-166.) J. W. Severinghaus. OEMsr-262; Service Project No. NS-246. MIT, Radiation Laboratory. June 1, 1944.

241.32 Intermediate Frequency

- M1** Intermediate frequency amplifier design. (Report No. 112.) (n.a.) MIT, Radiation Laboratory. April 3, 1942.
- M2** Development of a tunable intermediate frequency amplifier. (Report No. 99.) Walter F. Freeman. OEMsr-380. Sylvania Electric Products, Inc. November 16, 1942.
- M3** A 70-mc wide intermediate frequency amplifier. (Report No. 307.) Henry Wallman. MIT, Radiation Laboratory. June 26, 1943.
- M4** Stagger-tuned intermediate frequency amplifiers. (Report No. 524.) Henry Wallman. OEMsr-262. MIT, Radiation Laboratory. February 23, 1944.
- M5** The effect on noise figure of placing the gain control on the first intermediate frequency stage. (Report No. 528.) Yardley Beers and A. B. Macnee. OEMsr-262. MIT, Radiation Laboratory. March 9, 1944.
- M6** The use of a twin-T network in a selective frequency amplifier, with special applications. (Report No. 737.) Richard M. Walker and H. Fleisher. OEMsr-262. MIT, Radiation Laboratory. May 19, 1945.
- M7** Grounded grid intermediate frequency amplifiers. (Report No. 1030.) A. B. Macnee. OEMsr-262. MIT, Radiation Laboratory. January 18, 1946.
- M8** Intermediate frequency amplifier overload characteristics. (Report No. 1032.) S. A. Smith and F. M. Ashbrook. OEMsr-262. MIT, Radiation Laboratory. January 31, 1946.

241.4 Tubes

- M1** Committee on centimeter receiving tubes and resonators. (Report No. 286.) (n.a.) MIT, Radiation Laboratory. May, 1942.
- M2** [Some] 3-centimeter receiving tubes. (Report No. 106.) J. R. Pierce and A. L. Samuel. NDCrc-157. Bell Telephone Laboratories, Inc. Revised: June 22, 1942.
- M3** Clamping tubes. (Report No. 572.) C. W. Sherwin. OEMsr-262. MIT, Radiation Laboratory. May 12, 1944.

- M4** Pulse characteristics of common receiver-type tubes. (Report No. 704.) R. B. Woodbury. OEMsr-262. MIT, Radiation Laboratory. April 30, 1945.

241.41 Local Oscillators

- M1** A 1-cm oscillator. (Report No. 111.) (n.a.) MIT, Radiation Laboratory. March 11, 1942.
- M2** Development of a stable non-crystal controlled oscillator. (Report No. 98.) John M. Cage. OEMsr-546. University of Colorado. December 15, 1942.
- M3** Characteristics of the present production of McNally tubes. (Report No. 303.) Frances S. Bailey. MIT, Radiation Laboratory. June 3, 1943.
- M4** Noise from local oscillators. (Report No. 304.) Yardley Beers. MIT, Radiation Laboratory. June 8, 1943.
- M5** Measurement of electrical tuning ranges of 707 tubes. (Report No. 421.) J. S. Kirby-Smith. MIT, Radiation Laboratory. August 17, 1943.
- M6** Characteristics of recent 723-A tubes (X-band local oscillators). (Report No. 427.) Frances S. Bailey and Donald Blaisdell. MIT, Radiation Laboratory. September 4, 1943.
- M7** Notes on the power output of 723-A tubes. (Report No. S-7.) J. S. Kirby-Smith. OEMsr-262. MIT, Radiation Laboratory. February 19, 1944.
- M8** Characteristics of recent 723-A/B tubes. (Report No. 570.) Dorothy N. Sands and Frances S. Bailey. OEMsr-262. MIT, Radiation Laboratory. May 18, 1944.
- M9** Frequency discontinuities of local oscillator tubes due to high Q load circuits. (Report No. 694.) R. V. Pound. OEMsr-262. MIT, Radiation Laboratory. February 27, 1945.
- M10** A wide-excursion frequency modulated alignment oscillator or wobulator. (Report No. 738.) H. L. Johnson. OEMsr-262. MIT, Radiation Laboratory. May 31, 1945.
- M11** Characteristics of pre-production 2K-45 tubes. (Report No. 821.) Frances S. Bailey and Dorothy S. Beers. OEMsr-262. MIT, Radiation Laboratory. October 29, 1945.
- M12** Combined reflector-cavity automatic frequency control for thermally-tuned reflex oscillator tubes. (Report No. 1034.) George H. Nibbe. OEMsr-262. MIT, Radiation Laboratory. December 11, 1945.
- M13** A method for automatic frequency control of thermally-tuned oscillators. (Report No. 959.) George H. Nibbe. OEMsr-262. MIT, Radiation Laboratory. December 20, 1945.
- M14** Automatic frequency control of thermally-tuned beacon local oscillator. (Report No. 955.) M. W. P. Strandberg. OEMsr-262. MIT, Radiation Laboratory. March 6, 1946.
- M15** Video discriminator automatic frequency control. (Report No. 957.) M. W. P. Strandberg. OEMsr-

262. MIT, Radiation Laboratory. March 15, 1946.

241.411 Klystron

- M1** Klystron and continuous wave test sets. (Report No. 139.) (n.a.) MIT, Radiation Laboratory. December 19, 1940.
- M2** Operating instructions for the Model 417 klystron for use as a local oscillator in radar receivers. (Report No. M-108.) R. C. Rierdan and A. G. Hill. MIT, Radiation Laboratory. May 6, 1942.
- M3** Operating characteristics of the [Model] 417 reflex klystron. (Report No. 235.) C. S. Robinson, Jr. MIT, Radiation Laboratory. July 1, 1942.
- M4** Operating characteristics of the [Model] 419 klystron. (Report No. 251.) C. M. Hepperle. MIT, Radiation Laboratory. April 23, 1943.
- M5** K-band oscillator, Type A-5022A. (Report No. 383.) A. P. Kauzman. OEMsr-872. Radio Corporation of America. November 7, 1944.
- M6** Static frequency modulation characteristics of the reflex klystron. (Report No. 781.) D. R. Hamilton. OEMsr-262. MIT, Radiation Laboratory. August 1, 1945.
- M7** Electronic tuning of reflex oscillators. (Report No. 774.) J. B. H. Kuper and Dorothy S. Beers. OEMsr-262. MIT, Radiation Laboratory. August 1, 1945.
- M8** A low voltage K-band oscillator. (Report No. 764.) H. V. Neher. OEMsr-262; Service Project No. AN-25. MIT, Radiation Laboratory. September 17, 1945.
- M9** Effect of the tuning plunger on operation of 2K-33 type tubes. (Report No. 942.) George H. Vineyard. MIT, Radiation Laboratory. January 16, 1946.

241.412 Stabilization System

- M1** Frequency stabilization of oscillators by a method particularly adapted to the higher frequencies and magnetron sources. (Report No. 397.) L. E. Norton. OEMsr-684. Radio Corporation of America. May 1, 1944.
- M2** An electronic frequency stabilization system for continuous wave microwave oscillators. (Report No. 815.) R. V. Pound. OEMsr-262. MIT, Radiation Laboratory. October 1, 1945.
- M3** Improved frequency stabilization system for microwave oscillators. (Report No. 837.) R. V. Pound. OEMsr-262. MIT, Radiation Laboratory. October 26, 1945.

241.413 Reflex Oscillators

- M1** Operating characteristics of the [Model] 707-A reflex oscillator. (McNally tube.) (Report Nos. 233 and 234.) C. S. Robinson, Jr. [MIT, Radiation Laboratory.] June 9 and July 8, 1942.
- M2** Temperature-compensated [Model] 707-A McNally tube. (Report No. 236.) C. S. Robinson, Jr. MIT, Radiation Laboratory. August 25, 1942.
- M3** Notes on the reflex oscillator. (Report No. 709.)

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- Julian K. Knipp. OEMsr-262. MIT, Radiation Laboratory. May 3, 1945.
- M4** Notes on load effects in reflex oscillators. (Report No. 717.) J. B. H. Kuper and Maynard C. Waltz. OEMsr-262. MIT, Radiation Laboratory. May 29, 1945.
- M5** Operation and testing of reflex oscillators. (Report No. 742.) John C. Slater. OEMsr-262. MIT, Radiation Laboratory. June 18, 1945.
- M6** Measurements on noise from reflex oscillators. (Report No. 872.) J. B. H. Kuper and Maynard C. Waltz. OEMsr-262. MIT, Radiation Laboratory. December 21, 1945.
- M7** Theory of noise from the reflex oscillator. (Report No. 873.) Julian K. Knipp. OEMsr-262. MIT, Radiation Laboratory. January 10, 1946.
- M8** Electron optical studies of the 2K-33 tube. (Report No. 943.) George H. Vineyard. OEMsr-262. MIT, Radiation Laboratory. January 17, 1946.
- M9** A qualitative analysis of hysteresis in reflex oscillators. (Report No. 650.) J. B. Garrison. OEMsr-262. MIT, Radiation Laboratory. February 4, 1946.
- 241.42 Lighthouse Tubes**
- M1** Performance of the GL-446 lighthouse tube as a radio frequency amplifier in the 10- to 20-cm region. (Report No. 291.) William M. Breazeale and Maynard C. Waltz. MIT, Radiation Laboratory. October 5, 1942.
- M2** Lighthouse tube super-regenerative receivers. (Report No. 484.) R. I. Jacobson. MIT, Radiation Laboratory. November 17, 1943.
- M3** Frequency pulling of ARO-464 lighthouse cavities. (Report No. 91.) E. A. Slusser. MIT, Radiation Laboratory. February 14, 1944.
- M4** Rieke diagrams and probe plate plunger charts of lighthouse tubes in a re-entrant cavity. (Report No. 564.) R. E. Taylor. OEMsr-262. MIT, Radiation Laboratory. July 3, 1944.
- M5** Operational characteristics of 2C-43 tubes as pulsed oscillators in a re-entrant cavity. (Report No. 732.) M. E. Gardner. OEMsr-262. MIT, Radiation Laboratory. June 15, 1945.
- 241.43 Radio Frequency Amplifier**
- M1** Fine grid technique. (Report No. 299.) C. Nawrocki. MIT, Radiation Laboratory. April 3, 1943.
- 241.5 Video Crystals**
- 241.51 X-Band**
- M1** [Some] X-band video crystals. (Report No. 274.) W. E. Meyerhof and W. E. Stephens. OEMsr-388. University of Pennsylvania. May 20, 1944.
- M2** Burn-out of X-band video crystals. (Report No. 428.) Robert H. Vought, B. Serin and others. OEMsr-388. University of Pennsylvania. April 10, 1945.
- M3** X-band crystal video performance with bias. (Report No. 456.) W. E. Meyerhof, B. Serin and Robert H. Vought. OEMsr-388. University of Pennsylvania. July 6, 1945.
- M4** Development research on X-band video crystals. (Report No. 501.) W. E. Meyerhof. OEMsr-388. University of Pennsylvania. September 11, 1945.
- M5** Burn-out life tests of X-band video crystals. (Report No. 560.) B. Serin. OEMsr-388. University of Pennsylvania. October 11, 1945.
- 241.52 S-Band**
- M1** Low-level crystal detectors. Effect of heat and cold. (Report No. 440.) Eli Berman. MIT, Radiation Laboratory. November 19, 1943.
- M2** Temperature effects of S-band video crystals. (Report No. 505.) A. Smith and W. E. Stephens. OEMsr-388. University of Pennsylvania. September 20, 1945.
- M3** Burn-out of S-band video crystals. (Report No. 564.) Margaret N. Lewis. OEMsr-388. University of Pennsylvania. October 19, 1945.
- 241.6 Detectors**
- M1** Action of linear detector on signals in the presence of noise. (Report No. 305.) W. H. Jordan. MIT, Radiation Laboratory. July 6, 1943.
- M2** Noise filtering properties of third detectors. (Report No. 833.) Ralph S. Phillips. OEMsr-262. MIT, Radiation Laboratory. October 1, 1945.
- M3** New-type probe for coaxial standing wave detectors. (Report No. 835.) Howard Rowland. OEMsr-262. MIT, Radiation Laboratory. February 8, 1946.
- 241.7 Filters**
- M1** Impulse and square-pulse response of various filters. (Report No. 285.) Henry Wallman. MIT, Radiation Laboratory. June 10, 1942.
- M2** Infinite rejection filters. (Report No. 364.) Albert M. Stone and James L. Lawson. MIT, Radiation Laboratory. June 1, 1943.
- M3** Realizability of filters. (Report No. 637.) Henry Wallman. OEMsr-262. MIT, Radiation Laboratory. December 8, 1944.
- 242 Indicators**
- M1** Report of the Indicator Section. (Report No. 131.) Ernest C. Pollard. [MIT, Radiation Laboratory.] February 13, 1941.
- M2** Brief report of activities of Group VI [from] February 12 to March 4, 1941. (Report No. 132.) William M. Hall. MIT, Radiation Laboratory. March 4, 1941.
- M3** Report by Indicator Group. (Report No. 134.) Robert F. Bacher. MIT, Radiation Laboratory. May 14, 1941.
- M4** Indicators and synchronizers. (Report No. 47.) (n.a.) MIT, Radiation Laboratory. October 15, 1941.
- M5** Indicators and synchronizers. (Report No. 48.)

R. E. Meagher. MIT, Radiation Laboratory. November 19, 1941.

M6 Indicators and synchronizers. (Report No. 49.) R. E. Meagher and Ernest C. Pollard. MIT, Radiation Laboratory. December 24, 1941.

M7 Recommended designations of radar indicator types. (Report No. 159.) Robert F. Bacher. MIT, Radiation Laboratory. February 3, 1942.

M8 Indicator types as of October, 1942. (Report No. 114.) (n.a.) [October, 1942.]

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242.11 Audio

M1 Instruction manual audio indicator, Type 123-R. (Report No. M-122.) S. Newell. MIT, Radiation Laboratory. March 26, 1943.

M2 Manual for operation and maintenance of TW audio indicator. (Report No. M-134.) (n.a.) MIT, Radiation Laboratory. September 1, 1943.

242.12 Miscellaneous Types

M1 Tuning indicators and automatic tuning systems. (Report No. 107.) H. G. Weiss. MIT, Radiation Laboratory. September 15, 1941.

M2 Improvements in the spot error indicator. (Report No. 10.) (n.a.) MIT, Radiation Laboratory. February 6, 1942.

M3 [Some] AIA indicators. (Report No. 311.) L. A. Haworth. MIT, Radiation Laboratory. November 16, 1942.

M4 Indicators for a ground-controlled approach system. (Report No. 317.) C. W. Sherwin. MIT, Radiation Laboratory. July 1, 1943.

M5 Waveforms, voltage and resistance measurements in AN/APA-5 indicator equipment. (Report No. S-38.) G. Q. Lipscomb. OEMsr-262; Service Project Nos. AN-7 and NS-351. MIT, Radiation Laboratory. January 31, 1945.

M6 General purpose airborne indication system. (Report No. 817.) W. F. Goodell, Jr. OEMsr-262. MIT, Radiation Laboratory. January 18, 1946.

M7 A new secondary modulation indicator. F. G. Dunnington. OEMsr-262. MIT, Radiation Laboratory. March 25, 1946.

M8 Operating and maintenance instructions for indicator for rapid scan system. (Report No. M-249.) Paul Jarmotz. OEMsr-262. MIT, Radiation Laboratory. April 5, 1946.

M9 [The] SN-41/APA-53, Cadillac II synchronizer and IN-188/APA-53, Cadillac II indicator. (Report No. 937.) Paul Jarmotz. OEMsr-262. MIT, Radiation Laboratory. April 18, 1946.

242.2 Cathode-Ray Tubes

M1 Cathode-ray indicator. (Report No. 130.) (n.a.) [MIT, Radiation Laboratory.] December 29, 1940.

M2 Special report for the Cathode-Ray Tube Section. (Report No. 135.) (n.a.) MIT, Radiation Laboratory. February 28, 1941.

M3 Research and development leading to new and improved radar indicators. (Text and figures. Report No. 498.) H. W. Leverenz. NDCrc-150. Radio Corporation of America. June 30, 1945.

242.21 Types

M1 Vibration and shock comparison tests of 7-inch cathode-ray tubes in two different type mounts. (Report No. 390.) E. Pietz and M. D. Fagen. MIT, Radiation Laboratory. March 23, 1943.

M2 Radiation Laboratory conference on P-7 cathode-ray tubes, held April 5 and 6, 1943, Radiation Laboratory, MIT. (Report No. 314.) Wayne B. Nottingham. MIT, Radiation Laboratory. May 14, 1943.

M3 Performance characteristics of Army-Navy preferred-type electrostatic cathode-ray tubes. (Report No. 588.) R. P. Abbenhouse. OEMsr-262. MIT, Radiation Laboratory. July 6, 1944.

242.22 Skiatron

M1 Testing of skiatrons. (Report No. S-1 and Supplement.) Harry C. Kelly and Robert W. Hull. OEMsr-262. MIT, Radiation Laboratory. December 30, 1943 and May 6, 1944.

M2 Skiatron projection cathode-ray tubes with dark-trace P-10 screens. (Report No. 369.) R. B. Janes, N. A. Merck and L. B. Headrick. NDCrc-150. Radio Corporation of America. July 13, 1944.

M3 Completion of the development of the skiatron cathode-ray tube for projection indicator. (Report No. 492.) L. E. Swedlund. NDCrc-150. Radio Corporation of America. July 12, 1945.

242.23 Screens

M1 Tabulation of cathode-ray tube screen properties. (Report No. S-48.) A. B. White. OEMsr-262. MIT, Radiation Laboratory. May 1, 1945.

M2 Notes on photometry, colorimetry and an explanation of the centibel scale. (Report No. 804.) Wayne B. Nottingham. OEMsr-262. MIT, Radiation Laboratory. December 17, 1945.

242.231 Phosphors and Cascade Screens

M1 Luminescence of Radio Corporation of America cathode-ray tube with cascade screen. (Report No. 137.) Wayne B. Nottingham. MIT, Radiation Laboratory. February 2, 1942.

M2 Summary of research on radar indicator screens. (Report No. 103.) H. W. Leverenz. NDCrc-150. Radio Corporation of America. April 11, 1942.

M3 Slow phosphors for radar indicator screens. (Report No. 104.) Saul Dushman. OEMsr-248. General Electric Company. May 18, 1942.

M4 Proposed performance specifications for the P-7 long-persistence cascade screen. (Report No. 309.) Wayne B. Nottingham, J. T. Soller and Robert F. Bacher. MIT, Radiation Laboratory. August 12, 1942.

M5 Measurements of British cathode-ray tubes with

long-persistence screens. (Report No. 310.) Wayne B. Nottingham. MIT, Radiation Laboratory. October 7, 1942.

M6 Duplex-screen tubes. (Report No. 96 [for the period] from January 1 to December 31, 1941.) Saul Dushman. OEMsr-10. General Electric Company. October 14, 1942.

M7 Studies of British phosphors of the Types C, H, K and M. (Report No. 405.) Wayne B. Nottingham. MIT, Radiation Laboratory. August 2, 1943.

M8 Comparison of P-7 screen test methods. (Report No. S-9.) Wayne B. Nottingham. OEMsr-262. MIT, Radiation Laboratory. March 14, 1944.

M9 Investigations to prepare a transparent phosphor. (Report No. 572.) (n.a.) OEMsr-634. Carnegie Institution of Washington. July 31, 1945.

M10 Supplement to final report on research and development leading to new radar. OSRD Contract NDCrc-150, Progress Report No. Y: Method of measurement and some performance characteristics of P-14 screens, with a note on manufacturer's specifications for tubes containing P-14 screens. Indicators by H. W. Leverenz, June 30, 1945. (Report No. 586.) R. B. Innes. Radio Corporation of America. November 27, 1945.

M11 Evaluation of specifications for P-14 cathode-ray tube screens. (Report No. S-71.) A. B. White. OEMsr-262. MIT, Radiation Laboratory. January 14, 1946.

242.232 Dark-Trace Screens

M1 Dark-trace tube. (Report No. 147.) Saul Dushman. OEMsr-248. General Electric Company. March 1, 1943.

M2 Theory of dark-trace tubes. (Report No. 131.) Frederick Seitz, Jr., I. Estermann and others. OSRD No. 2276. Carnegie Institute of Technology. April 27, 1943.

M3 Dark-trace tubes. Memoranda on the May, 1943 meeting at the Radiation Laboratory. (Report No. 183.) I. Estermann, Robert J. Maurer and Frederick Seitz, Jr. OEMsr-900. Carnegie Institute of Technology. May, 1943.

M4 The theory of dark-trace tubes. ([Part] II. Report No. 172.) Frederick Seitz, Jr., O. Stern and others. OEMsr-900. Carnegie Institute of Technology. September 1, 1943.

M5 Darkening and bleaching of KCl. (Report No. 177.) I. Estermann and O. Stern. OEMsr-900. Carnegie Institute of Technology. September 1, 1943.

M6 Two notes on the potentials developed in cathode-ray screens during bombardment. (Report No. 178.) Frederick Seitz, Jr. OEMsr-900. Carnegie Institute of Technology. September 1, 1943.

M7 The scattering of light by dark-trace screens. (Report No. 198.) Robert J. Maurer and S. Lasof. OEMsr-900. Carnegie Institute of Technology. November 1, 1943.

M8 Darkening and bleaching of KCl. Part II, The effect of temperature. (Report No. 205.) I. Estermann and O. Stern. OEMsr-900. Carnegie Institute of Technology. November 24, 1943.

M9 The behavior of dark-trace screens containing magnesium. (Report No. 214.) Robert J. Maurer and S. Lasof. OEMsr-900. Carnegie Institute of Technology. December 1, 1943.

M10 Dark-trace radar indicator screens. (Text and figures. Report No. 249, for period of November, 1941 to May, 1943.) H. W. Leverenz. NDCrc-150. Radio Corporation of America. February 18, 1944.

M11 The theory of dark-trace tubes. ([Part] III. Report No. 257.) Frederick Seitz, Jr., O. Stern and others. OEMsr-900. Carnegie Institute of Technology. April 6, 1944.

M12 The depth of the darkened region and the build-up of darkening and persistent trace in KCl screens. (Report No. 258.) I. Estermann and G. I. Kirkland. OEMsr-900. Carnegie Institute of Technology. April 10, 1944.

M13 Theory of dark-trace tubes. ([Part] IV. Report No. 265.) Frederick Seitz, Jr. OEMsr-900. Carnegie Institute of Technology. May 8, 1944.

M14 Experiments with double-layer dark-trace screens. (Report No. 253.) Robert J. Maurer and S. Lasof. OEMsr-900. Carnegie Institute of Technology. May 12, 1944.

M15 The properties of evaporated layers of potassium chloride containing small additions of metallic elements when subjected to electron bombardment. (Report No. 326.) Robert J. Maurer and S. Lasof. OEMsr-900. Carnegie Institute of Technology. November 15, 1944.

M16 Aging of KCl crystals and screens under electron bombardment. (Report No. 302.) I. Estermann and G. I. Kirkland. OEMsr-900. Carnegie Institute of Technology. February 1, 1945.

242.233 Miscellaneous Screen Problems

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M2 The spectral distribution of the luminescence of red screen materials. (Report No. 269.) Robert L. Markson. Allen B. Du Mont Laboratories, Inc. March 24, 1944.

M3 Preparation of exponential decay powders and screens [using] $\text{ZnF}_2\text{:Mn}$, $\text{ZnMgF}_2\text{:Mn}$ and $\text{MgSiO}_3\text{:Mn}$. (Report No. 379.) B. S. Ellefson, L. W. Evans and others. OEMsr-1295. Sylvania Electric Products, Inc. December 1, 1944.

M4 Cathode-ray tube screen development. (Report No. 509 [for the period from] July 1, 1943 to December 31, 1944.) A. Steadman, S. J. Koch and P. S. Christaldi. OEMsr-1141. Allen B. Du Mont Laboratories, Inc. September 14, 1945.

242.24 Miscellaneous Cathode-Ray Tube Problems

M1 Circuits for improving focus of electrostatic

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M2 Cathode-ray tube detectors. (Report No. 376.) H. E. Farnsworth. OEMsr-382. Brown University. January, 1944.

M3 Focus coil control for cathode-ray tubes. (Report No. S-17.) R. D. Rawcliffe. OEMsr-262. MIT, Radiation Laboratory. May 17, 1944.

M4 Deflection yoke design information. (Report No. 674.) R. D. Rawcliffe. OEMsr-262. MIT, Radiation Laboratory. February 23, 1945.

M5 Video mapping. (Report No. 890.) John Hexem. OEMsr-262. MIT, Radiation Laboratory. January 29, 1946.

242.3 Plan Position Indicator

M1 The X-JO-3. (Report Nos. 53 and 54.) James F. Koehler. MIT, Radiation Laboratory. October 1 and November 5, 1941.

M2 Operating instructions for the Model B, PPI indicator central. (Report No. M-107.) C. W. Sherwin. MIT, Radiation Laboratory. April 9, 1942.

M3 Altitude determination by means of a vertical plan position indicator. (Report No. 351.) Dudley A. Williams. MIT, Radiation Laboratory. July 31, 1942.

M4 Plan position indicators. (Report No. 308.) (n.a.) MIT, Radiation Laboratory. August 4, 1942.

M5 Photographs of the PPI indicator tube with 3-cm air-to-surface vessel [radar] over water and land. (Report No. 381.) N. F. Ramsey, H. F. Balmer and E. A. Luebke. MIT, Radiation Laboratory. October 27, 1942.

M6 Some photographic measures of plan position indicator linearity and addendum. (Report No. 389.) N. U. Mayall. MIT, Radiation Laboratory. December 22, 1942.

M7 A shipborne mechanical rotation plan position indicator. (Report No. 315.) Leonard Mautner. MIT, Radiation Laboratory. June 3, 1943.

M8 Instruction manual for projection plan position indicator. (Report No. M-137.) H. O. Marcy, J. T. Soller and M. A. Starr. OEMsr-262. MIT, Radiation Laboratory. January 10, 1944.

M9 A comparison of positive and negative intensity modulation of plan position indicator displays. (Report No. S-4.) L. J. Haworth. OEMsr-262. MIT, Radiation Laboratory. January 26, 1944.

M10 A precision plan position indicator. (Report No. 560.) Warren L. Flock. OEMsr-262; Service Project No. NS-149. MIT, Radiation Laboratory. June 16, 1944.

M11 Plan position indicator for [SCR]-584 AJ. (Report No. 678.) M. A. Starr. OEMsr-262; Service Project No. SC-101. MIT, Radiation Laboratory. February 8, 1945.

M12 [The] plan position indicator off-center conversion kit, MX-364/CPS. (Report No. 778.) B. R. Curtis.

OEMsr-262; Service Project Nos. SC-60 and AC-234.04. MIT, Radiation Laboratory. August 1, 1945.

M13 Three-tone plan position indicator. (Report No. 934.) F. N. Barry. OEMsr-262. MIT, Radiation Laboratory. March 20, 1946.

242.31 Precision Plan Position Indicator (P³I)

M1 Final technical report [under] OSRD Developmental Contract OEMsr-1140. Part I, Equipment in present state of development, technical notes [and] general history. (Report No. 330.) Thomas T. Goldsmith, Jr. and R. L. Campbell. OEMsr-1140. Allen B. Du Mont Laboratories, Inc. October 30, 1944.

M2 [Final technical report under OSRD Developmental Contract OEMsr-1140. Part II,] Instruction book for precision plan position indicator adapter, DuMont Type No. 255. (Report No. 340.) (n.a.) OEMsr-1140. Allen B. DuMont Laboratories, Inc. (n.d.)

242.32 Photographic Projection Plan Position Indicator (P⁴I)

M1 [The] P⁴I, photographic projection plan position indicator. (Report No. 725.) L. L. Blackmer. OEMsr-262. MIT, Radiation Laboratory. April 26, 1945.

242.4 Indicator Accessories

M1 The identification of signals on plan position indicator photographs for the construction of radar maps. (Report No. 449.) N. U. Mayall. MIT, Radiation Laboratory. October 20, 1943.

M2 Electronic cursor for AN/APS-15. (Report No. M-175.) W. F. Goodell, Jr. OEMsr-262; Service Project Nos. SC-36 and NS-229. MIT, Radiation Laboratory. January 30, 1945.

M3 The radar chart projector. (Report No. 926.) D. B. McLaughlin and C. A. Smith. OEMsr-262. MIT, Radiation Laboratory. April 18, 1946.

242.5 Sweep Generators

M1 Errors in circular sweeps due to decentering and ellipticity of the circle. (Report No. 328.) E. B. Hales. MIT, Radiation Laboratory. February 13, 1943.

M2 Delayed sweep for SCR-582-X. (Report No. 337.) Britton Chance. MIT, Radiation Laboratory. June 11, 1943.

M3 A precision Z-sweep generator. (Report No. 563.) Robert A. McConnell. OEMsr-262; Service Project No. SC-73. MIT, Radiation Laboratory. May 23, 1944.

243 Ranging

M1 A definition of maximum range on aircraft and its quantitative determination. (Report No. 353.) Leon B. Linford, Dudley A. Williams and others. MIT, Radiation Laboratory. November 12, 1942.

M2 General relations determining the range of a

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- radar system. (Report No. 186.) D. H. Ewing. MIT, Radiation Laboratory. November 12, 1942.
- M3** Errors of optical range determination. (Report No. 91.5.) Paul R. Halmos. MIT, Radiation Laboratory. July 20, 1945.
- M4** Radar components that affect range. (Report No. S-73.) L. Davis, Jr. MIT, Radiation Laboratory. December 10, 1945.
- 243.1 Precision Ranging**
- M1** Circular sweep precision range system, Model 4. (Report No. 322.) Britton Chance. MIT, Radiation Laboratory. July 6, 1942.
- M2** Simplified circular sweep range system. (Report No. 325.) Britton Chance. MIT, Radiation Laboratory. September 10, 1942.
- M3** A precision self-synchronous range system for P3I. (Report No. 573.) George Hite, Glenn E. Whitham and Warren L. Flock. OEMsr-262; Service Project Nos. NS-149 and NS-153. MIT, Radiation Laboratory. May 26, 1944.
- M4** Medium precision range system for CXGQ, Project Henry. (Report No. 579.) George Hite. OEMsr-262; Service Project No. NS-250. MIT, Radiation Laboratory. September 9, 1944.
- M5** [The] A/R range scope. (Report No. 755.) Paul F. Brown, A. H. Frederick and W. E. Henry. OEMsr-262. MIT, Radiation Laboratory. June 29, 1945.
- 243.2 Ranging Circuits and Units**
- M1** Medium precision self-synchronous range circuit, Model 4. (Report No. 321.) Britton Chance. MIT, Radiation Laboratory. May 28, 1942.
- M2** [An] airborne range-only range unit. (Report No. 332.) E. F. MacNichol, Jr. MIT, Radiation Laboratory. April 9, 1943.
- M3** [The] H₂X range unit for navigation and bombing. (Report No. 342.) H. J. Reed, A. H. Frederick and Britton Chance. MIT, Radiation Laboratory. August 23, 1943.
- M4** A condenser phase shifter range unit with sine wave tracking for AN/TPG-1, AN/FPG-1 and SCR-598. (Report No. 516.) George Hite and Glenn E. Whitham. OEMsr-262. MIT, Radiation Laboratory. March 3, 1944.
- 243.21 Gates**
- M1** [The] N² gate attachment for SCR-584. (Report No. 566.) J. S. White and R. B. Leachman. OEMsr-262; Service Project No. SC-6. MIT, Radiation Laboratory. May 3, 1944.
- 243.22 Phase Shifter**
- M1** Errors in the condenser-type continuous phase shifter. (Report No. 633.) G. R. Gamertsfelder. OEMsr-262. MIT, Radiation Laboratory. December 6, 1944.
- 243.3 Measurements**
- M1** Errors in range measurement with a circular sweep. (Report No. 9.) (n.a.) MIT, Radiation Laboratory. January 24, 1942.
- 244 Tracking**
- M1** [Automatic tracking.] Section activities covering the period from May 14 to November 14, 1941. (Report No. 5.) MIT, Radiation Laboratory. November 15, 1941.
- 244.1 Theoretical Research**
- M1** Radar tracking analysis. (Report No. 495.) Elizabeth J. Campbell. OEMsr-262. MIT, Radiation Laboratory. February 5, 1944.
- M2** [The] APG-1 tracking and firing tests. Test Request [No.] 68. (Data Folder No. 72649.) J. A. Lawrence. General Electric Company. January 15, 1945.
- M3** An analysis of the tracking errors of the Mark 56-X system. (Report No. 884.) Ralph S. Phillips and Constance D. Boyd. OEMsr-262. MIT, Radiation Laboratory. March 1, 1946.
- 244.2 Experimental Systems**
- M1** Photoelectric automatic range tracking unit. (Report No. 324.) A. M. Grass, A. C. Hughes, Jr. and Britton Chance. MIT, Radiation Laboratory. January 25, 1943.
- M2** Analysis of overwater tracking. (Report No. 695.) Elizabeth J. Campbell. OEMsr-262; Service Project No. NO-166. MIT, Radiation Laboratory. February 12, 1945.
- M3** An analysis of the tracking of the [SCR-]584 X-band system. (Report No. 753.) Constance D. Boyd. OEMsr-262; Service Project No. SC-101. MIT, Radiation Laboratory. June 12, 1945.
- 244.21 XT-1 System**
- M1** Preliminary results with the XT-1. (Report No. 8.) (n.a.) MIT, Radiation Laboratory. [December, 1941.]
- M2** Antiaircraft Artillery Board test on XT-1 at Ft. Monroe, Virginia, February to March, 1942. (Report No. 368.) A. H. Warner. MIT, Radiation Laboratory. July 30, 1942.
- M3** Two motor-driven gun turrets. (Report No. 230.) S. Godet. OEMsr-10(c). General Electric Company. December 10, 1943.
- 244.3 Aided Tracking**
- M1** Aided tracking. (Report No. 430.) A. Sobczyk. MIT, Radiation Laboratory. September 17, 1943.
- M2** Aided tracking. (Parts I and II. Report Nos. 452 and 453.) A. Sobczyk and Ralph S. Phillips. MIT, Radiation Laboratory. November 3 and 4, 1943.
- M3** Tests of aided tracking with P3I. (Report No. 797.) H. A. Kirkpatrick and others. OEMsr-262; Service Project No. NS-149. MIT, Radiation Laboratory. September 25, 1945.

244.4 Smoothing

- M1** Theoretical calculation on best smoothing of position data for gunnery prediction. (Report No. 532.) Ralph S. Phillips and P. R. Weiss. OEMsr-262. MIT, Radiation Laboratory. February 16, 1944.
- M2** Data smoothing. (Report No. 673.) F. P. Coffin, Prescott D. Crout and Frank E. Bothwell. OEMsr-262. MIT, Radiation Laboratory. January 23, 1945.

244.5 Circuits

- M1** Medium precision, self-synchronous automatic range tracking circuit, Model 4. (Report No. 323.) E. F. MacNichol, Jr. and Britton Chance. MIT, Radiation Laboratory. June 18, 1942.
- M2** Range tracking circuit with position memory. (Report No. 160.) B. Rossi and K. Greisen. OEMsr-768. Cornell University. July 14, 1943.
- M3** Range tracking circuit with velocity memory. (Report No. 161.) B. Rossi and W. B. Jones. OEMsr-768. Cornell University. November 8, 1943.

245 Miscellaneous Receiver Components Research

- M1** Development of high-frequency video amplifier and radar ranging system. (Report No. 571.) J. P. Eckert, Jr. and T. K. Sharpless. OEMsr-387. University of Pennsylvania. November 14, 1945.

250 Test Equipment and Measurements**251 Test Equipment**

- M1** US radar survey. Section 6, Test equipment. (n.a.) May 15, 1945.

251.1 Attenuators and Attenuation

- M1** Coaxial platinum film attenuators. (Report No. 215.) John W. E. Griemsmann and Ernst Weber. Polytechnic Institute of Brooklyn. September 21, 1942.
- M2** Theory of coaxial attenuators. (Report No. 216.) John W. E. Griemsmann and Ernst Weber. Polytechnic Institute of Brooklyn. September 21, 1942.
- M3** Radio frequency attenuators. (Report No. 404.) S. G. Sydoriak. MIT, Radiation Laboratory. September 7, 1943.
- M4** Errors in attenuation measurements caused by reflection losses. (Report No. 365.) Ernst Weber. OEMsr-335. Polytechnic Institute of Brooklyn. March 16, 1945.
- M5** Influence of inner wave guide dimensions on broad-band performance of calibrated attenuators. (Report No. 473.) Anthony B. Giordano. OEMsr-335. Polytechnic Institute of Brooklyn. March 31, 1945.
- M6** Metallized-glass attenuators and miscellaneous radio frequency test accessories. (Report No. 360.) (n.a.) OEMsr-335. Polytechnic Institute of Brooklyn. April, 1945.
- M7** The accurate measurement of small attenuations at microwaves. (Report No. 439.) John E. Ebert.

OEMsr-335. Polytechnic Institute of Brooklyn. April 5, 1945.

- M8** The use of Sauereisen for cementing metallized-glass resistor plates. (Report No. 474.) John E. Ebert. OEMsr-335. Polytechnic Institute of Brooklyn. April 11, 1945.
- M9** Frequency sensitivity of metallized-glass attenuator inserts, Type TMS-4PB. (Report No. 477.) Harry C. Nelson. OEMsr-335. Polytechnic Institute of Brooklyn. May 11, 1945.
- M10** Frequency sensitivity of metallized-glass attenuator inserts, Type TMS-3PB. (Report No. 482.) Harry C. Nelson. OEMsr-335. Polytechnic Institute of Brooklyn. May 20, 1945.
- M11** Conference on metallized-glass plate program at Polytechnic Institute of Brooklyn. . . . (Report No. 479.) Ernst Weber. OEMsr-335. Polytechnic Institute of Brooklyn. May 22, 1945.
- M12** Microwave resistance comparator. (Report No. 481.) John E. Ebert. OEMsr-335. Polytechnic Institute of Brooklyn. May 22, 1945.
- M13** Accuracy of attenuation measurements made with the Ballantine voltmeter. (Report No. 480.) Harry C. Nelson. OEMsr-335. Polytechnic Institute of Brooklyn. May 30, 1945.
- M14** A resistive variable attenuator for K-band with 40-db maximum attenuation. (Report No. 486.) John E. Ebert and Stanley A. Johnson. OEMsr-335. Polytechnic Institute of Brooklyn. May 31, 1945.
- M15** Modifications pertaining to specifications for glass parts of PIB Type V-3 variable attenuator. (Report No. 478.) H. W. Schleuning. OEMsr-335. Polytechnic Institute of Brooklyn. June 2, 1945.
- M16** The TMX-14PB metallized-glass plate for variable X-band attenuator, maximum 25 db. (Report No. 483.) Anthony B. Giordano. OEMsr-335. Polytechnic Institute of Brooklyn. June 2, 1945.
- M17** The TMX-16PB metallized-glass plate for X-band fixed attenuator, 25 db. (Report No. 484.) Anthony B. Giordano. OEMsr-335. Polytechnic Institute of Brooklyn. June 2, 1945.
- M18** The TMX-24PB metallized-glass plate for X-band fixed attenuator pads of 10 db and 13 db. (Report No. 485.) Anthony B. Giordano. OEMsr-335. Polytechnic Institute of Brooklyn. June 26, 1945.
- M19** Electrical performance of metallized-glass attenuators for TS-147/UP in extended X-band. (Report No. 487.) Anthony B. Giordano. OEMsr-335. Polytechnic Institute of Brooklyn. July 6, 1945.
- M20** Precision metallization of glass. (Report No. 521.) (n.a.) OEMsr-335. Polytechnic Institute of Brooklyn. October 31, 1945.
- M21** Fixed value metallized-glass coaxial attenuators. (Report No. 522.) (n.a.) OEMsr-335. Polytechnic Institute of Brooklyn. October 31, 1945.
- M22** Variable metallized-glass coaxial attenuators. (Report No. 523.) (n.a.) OEMsr-335. Polytechnic Institute of Brooklyn. October 31, 1945.
- M23** The development of metallized-glass attenuating

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elements for X-band wave guide. (Report No. 525.) John E. Ebert. OEMsr-335. Polytechnic Institute of Brooklyn. October 31, 1945.

M24 Metallized-glass wave guide attenuators. (Report No. 526.) (n.a.) OEMsr-335. Polytechnic Institute of Brooklyn. October 31, 1945.

M25 The development of metallized-glass attenuators for test set TS-147/UP. (Report No. 527.) (n.a.) OEMsr-335. Polytechnic Institute of Brooklyn. October 31, 1945.

M26 Microwave attenuation standards. (Report No. 531.) (n.a.) OEMsr-335. Polytechnic Institute of Brooklyn. October 31, 1945.

M27 Microwave attenuation measurement. (Report No. 532.) Alice Nelson, Harry C. Nelson and others. OEMsr-335. Polytechnic Institute of Brooklyn. October 31, 1945.

M28 Precision metallized-glass resistor units. (Report No. 534.) (n.a.) OEMsr-335. Polytechnic Institute of Brooklyn. October 31, 1945.

M29 [Microwave radar field and laboratory test equipment and components.] Final report for OSRD Contract OEMsr-335 sponsored by NDRC, Division 14, Project No. 15.02. (Report No. 535.) (n.a.) OEMsr-335. Polytechnic Institute of Brooklyn. October 31, 1945.

M30 Capacitive-type radio frequency attenuators. (Report No. 995.) W. O. Smith. OEMsr-262. MIT, Radiation Laboratory. January 18, 1946.

M31 A grid-type radio frequency attenuator. (Report No. 902.) W. O. Smith. OEMsr-262. MIT, Radiation Laboratory. April 4, 1946.

251.2 Sweep Calibrators

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M2 Model II calibrator. (Report No. 333.) Britton Chance. MIT, Radiation Laboratory. April 1, 1943.

M3 Types J and A test unit. (Report No. 343.) H. Reed, A. H. Frederick and Britton Chance. MIT, Radiation Laboratory. August 21, 1943.

M4 Operating instructions for sweep calibrator, Model B. (Report No. M-188.) R. P. Abbenhouse. OEMsr-262. MIT, Radiation Laboratory. December 7, 1944.

M5 Operating instructions for sweep calibrator, Model B-8127. (Report No. M-223.) R. P. Abbenhouse. OEMsr-262. MIT, Radiation Laboratory. June 20, 1945.

251.3 Echo Boxes

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M2 Tentative operating instructions [for the] MIT, Radiation Laboratory echo box, Dwg. No. 3456. (Report No. M-128.) (n.a.) MIT, Radiation Laboratory. June 24, 1943.

M3 Echo box techniques for testing S-band shipborne radars. (Report No. M-146.) Seymour F. Johnson and Louis B. Young. MIT, Radiation Laboratory. November 24, 1943.

M4 Preliminary instruction manual for echo box [for radio set] SCR-584. (Report No. M-159.) L. L. Davenport. OEMsr-262. MIT, Radiation Laboratory. March 6, 1944.

M5 Instruction manual for echo box test kit. (Report No. M-165.) Herbert H. Wheaton and J. M. Wolf. OEMsr-262; Service Project No. NS-246. MIT, Radiation Laboratory. June 1, 1944.

M6 Theory of ringing time of tunable echo boxes. (Report No. 630.) A. Banos, Jr. OEMsr-262. MIT, Radiation Laboratory. November 3, 1944.

M7 Design of an improved X-band echo box. (Report No. 631.) A. Banos, Jr. OEMsr-262. MIT, Radiation Laboratory. December 7, 1944.

M8 A treatment of echo box problems by Lagrangian procedures. (Report No. 629.) Prescott D. Crout and Norman H. Painter. OEMsr-262. MIT, Radiation Laboratory. January 13, 1945.

M9 A treatment of echo box problems by Lagrangian procedures. (Part II. Report No. 696.) Prescott D. Crout and Norman H. Painter. OEMsr-262. MIT, Radiation Laboratory. March 16, 1945.

M10 Handbook of operating and maintenance instructions for echo boxes TES-8MK and TES-9MK. (Report No. M-194.) F. B. Wood. OEMsr-262. MIT, Radiation Laboratory. March 24, 1945.

M11 Echo box application. (Report No. 1040.) J. M. Wolf. OEMsr-262. MIT, Radiation Laboratory. April 18, 1946.

251.4 Frequency

251.41 Meters

M1 Instructions for Types TFK-2HU, TFK-3HU and TFK-6HU frequency meters. (Report Nos. M-176A and M-176B.) S. Katz. OEMsr-262. MIT, Radiation Laboratory. August 17, 1944 and April 12, 1945.

M2 [Type] TFX-29RL frequency comparator. (Report No. 681.) L. G. Mann. OEMsr-262. MIT, Radiation Laboratory. February 16, 1945.

M3 Instructions for Types TFX-17GA, TFX-18GA, TFX-19GA, TFX-30EC, TFX-31EC, Model 51 and similar types of micrometer frequency meters. (Report No. M-217.) F. B. Wood. OEMsr-262. MIT, Radiation Laboratory. May 3, 1945.

251.42 Standard

M1 [The] TFX-34RL fixed frequency standard. (Report No. M-207.) H. A. Gardner. OEMsr-262. MIT, Radiation Laboratory. April 26, 1945.

M2 [The] TFX-35RL fixed frequency standard. (Report No. M-208.) H. A. Gardner. OEMsr-262. MIT, Radiation Laboratory. April 26, 1945.

M3 [The] TFX-36RL fixed frequency standard. (Re-

port No. M-209.) H. A. Gardner. OEMsr-262. MIT, Radiation Laboratory. April 26, 1945.

251.5 Spectrum Analyzer

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- M2** Instruction manual for the spectrum analyzer, Type 105, for X-band pulsed oscillators and spectrum analyzer, Type 107, for S-band pulsed oscillators. (Report No. M-127.) (n.a.) MIT, Radiation Laboratory. July 14, 1943.
- M3** A continuously indicating audio spectroscopy for continuous wave systems. (Report No. 61.) R. H. Dicke. MIT, Radiation Laboratory. December 30, 1943.
- M4** Instructions for TSX-2 spectrum analyzer. (Report No. M-173.) S. Katz. OEMsr-262; Service Project No. NA-184. MIT, Radiation Laboratory. August 5, 1944.
- M5** Instructions for TSX-2 and specifications on TSX-4SE spectrum analyzers. (Report No. M-173B.) S. Katz. OEMsr-262. MIT, Radiation Laboratory. October 5, 1944.
- M6** Instructions for TSX-2 and specifications on TSX-4SE and TSS-4SE spectrum analyzers. (Report No. M-173C.) S. Katz. OEMsr-262; Service Project No. NA-184. MIT, Radiation Laboratory. November 4, 1944.
- M7** Instructions for Type TSK-1SE spectrum analyzer. (Report No. M-142.) S. Katz, I. Shapiro and F. B. Wood. OEMsr-262. MIT, Radiation Laboratory. July 3, 1945.
- M8** Instructions for Type TSK-5SE spectrum analyzer. (Report No. M-231.) F. B. Wood. OEMsr-262. MIT, Radiation Laboratory. February 11, 1946.

251.6 Signal and Pulse Generators

- M1** A 30-mc pulsed signal generator. (Report No. 109.) (n.a.) MIT, Radiation Laboratory. October 16, 1941.
- M2** Multiple pulse generator. (Report No. 278.) W. O. Reed. MIT, Radiation Laboratory. October 15, 1942.
- M3** Pulsed oscillator, 3,000 mc/sec, Model No. 1. (Report No. M-117.) (n.a.) MIT, Radiation Laboratory. February 8, 1943.
- M4** Development of pulsed signal generator. (Report No. 174.) W. P. Mueller and F. L. Burroughs. OEMsr-583. Sylvania Electric Products, Inc. June 21, 1943.
- M5** Handbook of maintenance instructions for Type TTX-1BL test set (Type B). (Report No. M-133.) F. B. Wood. OEMsr-262. MIT, Radiation Laboratory. February 1, 1944.
- M6** Instructions for Type TTX-6RH and Type TTX-10RH test sets. (Report No. M-169.) S. Katz. OEMsr-262. MIT, Radiation Laboratory. June 8, 1944.
- M7** Revision of General Radio Type 605-B signal

generator for pulsing. (Report No. 575.) Clyde E. Ingalls. OEMsr-262; Service Project No. NS-246. MIT, Radiation Laboratory. June 13, 1944.

- M8** Instructions for Types TTX-6, TTX-9, TTX-10, TTX-12 and TS-263/TPS-10 test sets. (Report No. M-169B.) S. Katz. OEMsr-262; Service Project No. NA-184. MIT, Radiation Laboratory. September 13, 1944.
- M9** Instructions for TGX-2BL and TGX-3BL signal generators. (Report No. M-143A.) F. B. Wood and E. A. S. Jacobson. OEMsr-262. MIT, Radiation Laboratory. December 21, 1944.
- M10** Instructions for TGS-6DE boresighting signal generator. Preliminary model of test set TS-348/AP. (Report No. M-198A.) E. A. S. Jacobson. OEMsr-262. MIT, Radiation Laboratory. February 10, 1945.
- M11** Handbook of operating and maintenance instructions for test set TS-259(XR-1)/AP, with supplements on test sets, TS-259(XR-2)/AP and TS-259(XR-3)/AP and signal generator, TS-259/AP. (Report No. M-193A.) S. Katz and F. B. Wood. OEMsr-262; Service Project Nos. NA-181 and SC-106.06. MIT, Radiation Laboratory. February 17, 1945.
- M12** Handbook of operating and maintenance instructions for test set, TGI-3CA. (Report No. M-204.) Charles A. Meyer. OEMsr-262. MIT, Radiation Laboratory. March 28, 1945.
- M13** Preliminary maintenance and operating instructions for the TS-364/APX-15 test set. (Report No. M-202.) B. L. Birchard. OEMsr-262; Service Project Nos. AC-120 and SC-69. MIT, Radiation Laboratory. April 4, 1945.
- M14** Instructions for TGS-2SE, TGS-3BL and TGS-5BL signal generators. (Report No. M-141.) E. A. S. Jacobson. OEMsr-262. MIT, Radiation Laboratory. October 11, 1945.
- M15** Black Maria check set, TS-495/APX. (Report No. M-233.) Arthur Fong. OEMsr-262; Service Project No. NA-178. MIT, Radiation Laboratory. November 16, 1945.
- M16** Instructions for TS-416/AP check set. (Report No. M-234.) J. W. Severinghaus. OEMsr-262; Service Project Nos. SC-6305 and NA-163. MIT, Radiation Laboratory. February 11, 1946.
- M17** A trigger generator for signal threshold studies. (Report No. 1036.) R. R. Meijer. OEMsr-262. MIT, Radiation Laboratory. April 2, 1946.

251.61 Pulsed Oscillator

- M1** Pulsed oscillator and phase shifter. (Report No. 340.) G. R. Gamertsfelder. MIT, Radiation Laboratory. July 22, 1943.
- M2** Pulsed quartz crystal oscillator. (Report No. 803.) Paul F. Brown. OEMsr-262. MIT, Radiation Laboratory. August 21, 1945.

251.7 Oscilloscopes and Synchroscopes

SECRET

251.71 Oscilloscopes

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- M2** Determination of logarithmic constants of crystal rectifiers with the oscilloscope. (Report No. 143.) H. J. Yearian. OEMsr-362. Purdue University. April 20, 1943.
- M3** Oscilloscope presentation of hysteresis loops at 60 cycles and under pulse conditions. (Report No. 218.) Winston H. Bostick, P. Roger Gillette and Harold L. Rehkopf. MIT, Radiation Laboratory. June 1, 1943.
- M4** Types TON-1GA (Type Q) and TON-1BL oscilloscopes. (Report No. M-140.) F. B. Wood. OEMsr-262. MIT, Radiation Laboratory. April 24, 1944.

251.72 Synchrosopes

- M1** Manual of operation [for the] Model No. 2 synchroscope. (Report No. M-112.) F. J. Gaffney. MIT, Radiation Laboratory. June 13, 1942.
- M2** Instruction manual [for the] Model P-4 synchroscope. (Report No. M-118.) (n.a.) MIT, Radiation Laboratory. March 2, 1943.
- M3** Model P4-E synchroscope and radio frequency envelope indicator. (Report No. M-124.) (n.a.) MIT, Radiation Laboratory. June 18, 1943.
- M4** Synchroscope handbook for Model SYN-15. (Report No. M-147.) Martin J. Cohen. OEMsr-262. MIT, Radiation Laboratory. December, 1943.
- M5** Revised Model P-4. synchroscope (Report No. M-126.) (n.a.) MIT, Radiation Laboratory. March 20, 1944.
- M6** Model 5 synchroscope. (Report No. S-18.) George H. Nibbe. OEMsr-262. MIT, Radiation Laboratory. June 2, 1944.
- M7** Operating instructions [for] Radiation Laboratory Model 5 synchroscope. (Report No. M-212.) R. P. Abbenhouse. OEMsr-262. MIT, Radiation Laboratory. July 3, 1945.
- M8** Winterscope, or fast sweep synchroscope. (Report No. 1001.) D. F. Winter. OEMsr-262. MIT, Radiation Laboratory. April 12, 1946.

251.8 Synchronizers

- M1** Instruction manual for the Browning Type A synchronizer. (Report No. 74.) F. J. Gaffney. MIT, Radiation Laboratory. October 29, 1941.
- M2** Report of activities of Synchronizer Section. (Report No. 75.) F. J. Gaffney, C. G. Montgomery and Paul D. Bales. MIT, Radiation Laboratory. November 5, 1941.
- M3** Operating instructions for Model G synchronizer. (Report No. M-195A.) R. P. Abbenhouse and F. N. Gillette. OEMsr-262. MIT, Radiation Laboratory. March 15, 1945.

251.9 Miscellaneous Test Units

(See also: 121.2)

- M1** The operation of the screen cage. (Report No.

45.) Andrew Longacre. MIT, Radiation Laboratory. October 8, 1941.

- M2** Radio frequency envelope indicator instruction manual. (Report No. 77.) F. G. Dunnington and H. D. Doolittle. MIT, Radiation Laboratory. December 10, 1941.
- M3** Measuring instruments for three centimeters. (Report No. 26.) S. Roberts, R. H. Dicke and J. S. Foster. MIT, Radiation Laboratory. March 9, 1942.
- M4** Measurements with a frequency-modulated oscillator at 3 cm. (Report No. 167.) C. G. Montgomery and Dorothy D. Montgomery. MIT, Radiation Laboratory. January 18, 1943.
- M5** Tentative instruction manual [for the] MIT, Radiation Laboratory test set, Type A. (Report No. M-120.) (n.a.) MIT, Radiation Laboratory. March 25, 1943.
- M6** Tentative operating instruction [for the] MIT, Radiation Laboratory modified Type 102-A test set (Type 102A-1). (Report No. M-123.) (n.a.) MIT, Radiation Laboratory. May 19, 1943.
- M7** Radio set RHB. Section IV, RHB test equipment. (Report No. 508-3.) J. J. Hibbert and J. E. Ward. OEMsr-262. MIT, Radiation Laboratory. January 27, 1944.
- M8** Lighthouse radio frequency envelope indicator. (Report No. 542.) P. A. Cole, J. B. H. Kuper and Kenneth R. More. OEMsr-262. MIT, Radiation Laboratory. April 7, 1944.
- M9** [The] matchmeter. (Report No. 705.) Heinz E. Kallmann. OEMsr-262. MIT, Radiation Laboratory. April 9, 1945.
- M10** Broad-band test loads. (Report No. 847.) Richard M. Walker. OEMsr-262. MIT, Radiation Laboratory. October 9, 1945.
- M11** Design proposal for AN/APN-19A check set. (Report No. 1062.) R. S. Chaloff, R. J. Harrison and others. OEMsr-262. MIT, Radiation Laboratory. March 27, 1946.

252**Measurements**

- M1** [Some] X-band low pressure tests. (Report No. 241.) T. S. Saad. MIT, Radiation Laboratory. December 10, 1942.

252.1**Impedance**

- M1** The standing wave detector. (Report No. 344.) James L. Lawson. MIT, Radiation Laboratory. May 5, 1942.
- M2** Measurement of impedance with the standing wave detector. (Report No. 346.) James L. Lawson. MIT, Radiation Laboratory. May 18, 1942.
- M3** Explanation of impedance matching. (Report No. T-6.) H. Krutter. MIT, Radiation Laboratory. July 7, 1942.
- M4** Reflection coefficients and impedance charts. (Report No. T-11.) S. Katz. MIT, Radiation Laboratory. November 9, 1942.
- M5** The theory of impedance and admittance dia-

grams and allied subjects. (Report No. T-10.) Samuel Seely. MIT, Radiation Laboratory. February 18, 1943.

- M6** The use of the magic tee microwave bridge in measuring impedance. (Report No. 643.) R. L. Kyhl. OEMsr-262. MIT, Radiation Laboratory. December 12, 1944.

- M7** X-band slotted section test equipment. (Report No. 476.) John W. E. Griemsmann. OEMsr-335. Polytechnic Institute of Brooklyn. April 25, 1945.

- M8** Instructions for TBK-2RL impedance bridge. (Report No. M-237.) E. C. Simmons and F. B. Wood. OEMsr-262. MIT, Radiation Laboratory. February 13, 1946.

252.2 Pulses

- M1** A diode-type pulse voltmeter. (Report No. 521.) O. T. Fundingsland. OEMsr-262. MIT, Radiation Laboratory. July 6, 1944.

- M2** Voltage pulse rate-of-rise measurements. (Report No. 523.) O. T. Fundingsland. OEMsr-262. MIT, Radiation Laboratory. July 10, 1944.

- M3** A measurement of supersonic velocity in mercury at 15 megacycles per second as a function of temperature. (Report No. 745.) Robert I. Jacobson. OEMsr-262. MIT, Radiation Laboratory. September 20, 1945.

252.3 Tubes

- M1** Measurement of pressure in gas tubes by a radio frequency method. (Report No. 432.) M. L. Yeater. OEMsr-262. MIT, Radiation Laboratory. September 9, 1944.

252.4 Power

- M1** Microwave wattmeter. (Report No. 239.) M. H. Johnson. MIT, Radiation Laboratory. November 18, 1942.

- M2** Loss measurement by two-probe power reversal method. (Report No. 240.) George L. Ragan. MIT, Radiation Laboratory. December 7, 1942.

- M3** Microwave wattmeter, 3-cm and 1-cm. (Part II. Report No. 246.) M. H. Johnson and J. B. Wiesner. MIT, Radiation Laboratory. January 21, 1943.

- M4** Low-level power measurement at 10 cms in coax. (Report No. 279.) R. N. Griesheimer. MIT, Radiation Laboratory. March 16, 1943.

- M5** Bridge methods in low and medium-level radio frequency power measurement. (Report No. 410.) R. N. Griesheimer. MIT, Radiation Laboratory. September 14, 1943.

- M6** A relative power measurer for the transmit-receive test bench. (Report No. 53. Supplement to Report No. 417.) L. D. Smullin. MIT, Radiation Laboratory. March 24, 1944.

- M7** Instructions for Types TWS-5 and TSW-5EV battery-operated wattmeters, preliminary models of TS-125/AP. (Report No. M-174.) E. A. S. Jacobson, J. W. Severinghaus and F. B. Wood.

OEMsr-262; Service Project No. SC-106.01. MIT, Radiation Laboratory. August 4, 1944.

- M8** Instructions for Type TBN-6SE thermistor bridge. (Report No. M-203.) E. A. S. Jacobson and J. W. Severinghaus. OEMsr-262. MIT, Radiation Laboratory. November 14, 1945.

252.41 Bolometer

- M1** The Littlefuse bolometer. (Report Nos. 145 and 145a.) (n.a.) MIT, Radiation Laboratory. October 28, 1941.

- M2** A 10- to 20-centimeter bolometer. (Report No. 288.) William M. Breazeale. MIT, Radiation Laboratory. August 26, 1942.

- M3** [A] 3-cm bolometer detector suitable for field measurements, Type Y. (Report No. 262.) Stanley Breen. MIT, Radiation Laboratory. December 11, 1942.

- M4** Instructions for use of PIB Type 1B-2 bolometer terminal. (Report No. 218.) Stanley A. Johnson. Polytechnic Institute of Brooklyn. May 26, 1943.

- M5** Notes on the use of bolometers for ultra high frequency attenuation measurements. (Report No. 219.) John E. Ebert. OEMsr-335. Polytechnic Institute of Brooklyn. June 2, 1943.

- M6** The 1B-2 bolometer terminal. (Report No. 220.) John E. Ebert, Stanley A. Johnson and Ernst Weber. OEMsr-335. Polytechnic Institute of Brooklyn. June 11, 1943.

- M7** A Littlefuse direct-reading wattmeter. (Report No. 548.) C. M. Sorvaag. OEMsr-262. MIT, Radiation Laboratory. April 28, 1944.

- M8** Metallized-glass bolometers. (Report No. 524.) (n.a.) OEMsr-335. Polytechnic Institute of Brooklyn. October 31, 1945.

- M9** Microwave power measurement with bolometers. (Report No. 529.) (n.a.) OEMsr-335. Polytechnic Institute of Brooklyn. October 31, 1945.

252.42 Thermistor Bridge

- M1** The investigation of the effect of manufacturing and test equipment variables on the X-band characteristics of Bell System thermistors. (Report No. 227.) J. N. Shive. OEMsr-1212. Bell Telephone Laboratories, Inc. November 26, 1943.

- M2** The two-disc direct current thermistor bridge circuit. (Report No. 502.) Ruth Krock and Norman H. Painter. OEMsr-262. MIT, Radiation Laboratory. January 12, 1944.

- M3** Instructions for Type TBN-3EV thermistor bridge. (Report No. M-186A.) E. A. S. Jacobson and J. W. Severinghaus. OEMsr-262. MIT, Radiation Laboratory. January 15, 1945.

- M4** The investigation of the effect of manufacturing and test equipment variables on the X- and K-band characteristics of Bell System thermistors. (Report No. 462.) J. B. Stucky, Jr. OEMsr-1212. Bell Telephone Laboratories, Inc. July 30, 1945.

252.5 Miscellaneous Measurements

- M1** Relay data including shock and vibration measurements. (Report No. 747.) H. W. Baur. OEMsr-262; Service Project No. NS-177. MIT, Radiation Laboratory. August 1, 1945.
- M2** Conductivity loss measurements at K-band. (Report No. 854.) E. Maxwell. OEMsr-262. MIT, Radiation Laboratory. January 15, 1946.
- M3** Modulation of radar signals from airplanes. (Report No. 914.) R. M. Ashby, Francis W. Martin and James L. Lawson. OEMsr-262. MIT, Radiation Laboratory. March 28, 1946.
- M4** Instructions for K-band testing. (Report No. M-238.) A. J. Zink and F. B. Wood. OEMsr-262. MIT, Radiation Laboratory. April 5, 1946.

253 Radar System Tests

253.1 AN/APA-5, AN/APN-19 and AN/APS-15 and -30

- M1** AN/APA-5 tests, July 18 to 22, 1944. Preliminary report, 1000-foot runs. (n.a.) MIT, Radiation Laboratory. August 7, 1944.
- M2** AN/APA-5 tests, August 4 to 12, 1944. Preliminary report, 5000-foot runs. (n.a.) MIT, Radiation Laboratory. August 17, 1944.
- M3** AN/APA-5 tests, August 25 to 28, 1944. Preliminary report, 15,000-foot runs. (n.a.) MIT, Radiation Laboratory. September 6, 1944.
- M4** AN/APS-15A and AN/APS-15B tests. (Report No. S-57.) R. C. Ottens. OEMsr-262; Service Project Nos. SC-36, NS-229 and AC-23202. MIT, Radiation Laboratory. November 21, 1945.
- M5** Interference measurements on the AN/APS-30 series. (Report No. 998.) Rex G. Fluharty. OEMsr-262; Service Project Nos. AN-21 and NS-314. MIT, Radiation Laboratory. February 20, 1946.

253.2 Targets

- M1** The so-called standard target. (Report No. S-43.) A. H. Brown. OEMsr-262. MIT, Radiation Laboratory. March 10, 1945.

253.3 Miscellaneous Tests on Radar Systems

- M1** [Radar system tests.] Meeting of *ad hoc* Committee of the Joint Radio Board. (Report No. JRB-20.) F. R. Banks. Joint Radio Board. April 25, 1945.

260 Special Components, Accessories and Methods

261 Communications

- M1** Modulated pulse communication. (Report No. 216.) A. S. Jerrems and A. E. Whitford. MIT, Radiation Laboratory. April 13, 1943.
- M2** Radiotelephone communication on 3000 megacycles. (Report No. 152.) Paul A. Anderson, C. L. Barker and others. OEMsr-728. Washington State College. June 12, 1943.
- M3** Handbook of maintenance instructions for AN/

AIC-6 intercommunication system. (Report No. M-244.) W. R. Slaunwhite and R. L. Kellner. OEMsr-262; Service Project No. NA-178. MIT, Radiation Laboratory. October 23, 1945.

- M4** A duplex communication system for microwaves. (Report No. 830.) R. V. Pound. OEMsr-262. MIT, Radiation Laboratory. November 20, 1945.

261.1 Schering Bridge

- M1** A 30-mc Schering bridge. (Report No. 301.) Yardley Beers. MIT, Radiation Laboratory. May 12, 1943.
- M2** A 60-mc parallel Schering bridge. (Report No. 558.) Yardley Beers. OEMsr-262. MIT, Radiation Laboratory. April 22, 1944.

262 Countermeasures

262.1 Jamming and Interference

- M1** Some general microwave antijam design considerations and performance of a special receiver. (Report No. S-8.) P. R. Bell, Jr. and Fred M. Ashbrook. OEMsr-262. MIT, Radiation Laboratory. February 24, 1944.
- M2** Window tests on AN/CPS-6, Leesburg, Florida, June 7 and 9, 1944. (Report No. S-20.) Leon B. Linford and J. Millman. OEMsr-262; Service Project No. SC-74. MIT, Radiation Laboratory. July 8, 1944.
- M3** Interference blanker. (Report No. 749.) Robert W. Hull. OEMsr-262; Service Project Nos. SC-60, SC-75 and others. MIT, Radiation Laboratory. June 20, 1945.
- M4** Synthetic radar echoes in the presence of jamming. (Report No. 708.) Albert M. Stone. OEMsr-262. MIT, Radiation Laboratory. June 22, 1945.
- M5** Pulsed-interference suppression. (Report No. 826.) James L. Lawson. OEMsr-262. MIT, Radiation Laboratory. October 15, 1945.
- M6** S-band tunable systems. (Report No. 911.) John E. Cook and John E. Richardson. OEMsr-262. MIT, Radiation Laboratory. March 21, 1946.
- M7** Off-frequency continuous wave jamming. (Report No. 910.) C. McKay Allred and Andrew L. Gardner. OEMsr-262. MIT, Radiation Laboratory. March 22, 1946.
- M8** Synthetic radar echoes in the presence of frequency modulation jamming. (Report No. 1035.) Albert M. Stone. OEMsr-262. MIT, Radiation Laboratory. April 9, 1946.

262.2 Camouflage

- M1** Radar camouflage. (Report No. 766.) M. M. Andrew, Otto J. Baltzer and others. OEMsr-262; Service Project No. NS-296. MIT, Radiation Laboratory. July 16, 1945.

262.3 Enemy Equipment

- M1** Japanese microwave radar. (Report No. S-24.)

A. M. Clogston. OEMsr-262. MIT, Radiation Laboratory. August 26, 1944.

263 Moving Target Identification (MTI)

- M1** A moving target selector using deflection modulation on a storage mosaic. (Report No. 562.) Robert A. McConnell, A. G. Emslie and F. Cunningham. OEMsr-262; Service Project No. SC-73. MIT, Radiation Laboratory. June 6, 1944.
- M2** Bibliography of Radiation Laboratory literature on moving target identification, as of February 6, 1945. (Report No. 65.) (n.a.) MIT, Radiation Laboratory. February 6, 1945.
- M3** Some moving target identification nomenclature in use at Radiation Laboratory, MIT. (Report No. 65.) Robert A. McConnell. MIT, Radiation Laboratory. May 2, 1945.
- M4** Moving target identification for microwave early warning [radar]. (Report No. 752.) George Nonnemaker. OEMsr-262; Service Project No. SC-73. MIT, Radiation Laboratory. May 24, 1945.
- M5** Preliminary technical manual for SCR-584 moving target identification modification kit No. MC-642-AS and fan beam search antenna. (Report No. M-218.) H. B. Bekkar. OEMsr-262; Service Project No. SC-73. MIT, Radiation Laboratory. June 1, 1945.
- M6** Estimated limitations of kit MC-642, moving target identification for SCR-584. (Report No. 65.) F. Cunningham and Robert A. McConnell. MIT, Radiation Laboratory. June 18, 1945.
- M7** Moving target identification using coherent intermediate frequency. A. G. Emslie. MIT, Radiation Laboratory. August 22, 1945.
- M8** A method of rating the stability of oscillators for moving target identification. (Report No. 819.) S. Roberts. OEMsr-262; Service Project No. SC-73. MIT, Radiation Laboratory. October 16, 1945.
- M9** Moving target indication on microwave early warning [radar]. (Report No. 1080.) A. G. Emslie. OEMsr-262. MIT, Radiation Laboratory. February 19, 1946.
- M10** Dynamic range compression for moving target identification. (Report No. 1016.) Walter Selove. OEMsr-262. MIT, Radiation Laboratory. March 15, 1946.
- M11** Notes on moving target identification receivers. (Report No. 1010.) Walter Selove. OEMsr-262. MIT, Radiation Laboratory. March 25, 1946.
- M12** An experimental S-band airborne moving target identification system. (Report No. 1018.) H. G. Voorhies, Jr. OEMsr-262. MIT, Radiation Laboratory. March 29, 1946.
- M13** A moving coherent oscillator conversion unit. (Report No. 975.) Verland A. Olson. OEMsr-262; Service Project No. SC-73. MIT, Radiation Laboratory. April 3, 1946.
- M14** An experimental moving target identification system. (Report No. 744.) Robert A. McConnell.

OEMsr-262. MIT, Radiation Laboratory. April 18, 1946.

- M15** Supersonic solid delay lines. (Report No. 932.) David L. Arenberg. OEMsr-262. MIT, Radiation Laboratory. April 30, 1946.

263.1 Clutter

- M1** The detection of moving targets among ground clutter by coherent pulse methods. (Report No. 480.) Robert A. McConnell. MIT, Radiation Laboratory. December 14, 1943.
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- M2** The effects of cavity bias on the airborne range-only cavity operated by the ARO modulator. (Report No. 91.) E. A. Slusser. MIT, Radiation Laboratory. April 27, 1944.
- M3** Range accuracy of AN/APG-5, airborne range-only equipment. (Report No. 820.) R. M. Whitmer. OEMsr-262; Service Project No. AC-235.01. MIT, Radiation Laboratory. October 15, 1945.
- M4** [The] history of AN/APG-5, airborne range-only equipment. A. F. Sise and B. P. Bogert. MIT, Radiation Laboratory. January 15, 1946.
- M5** [The] AN/APG-5, airborne range-only equipment as a terrain clearance indicator. (Report No. 908.) Robert M. Whitmer. OEMsr-262. MIT, Radiation Laboratory. January 16, 1946.
- M6** Handbook of maintenance instructions for radio sets AN/APG-5 and AN/APG-5A. (Report No. 569.) (n.a.) OEMsr-972. Galvin Manufacturing Corporation. (n.d.)

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- M1** Special project on ARS, aircraft radio sight. (Report No. 4.) (n.a.) [MIT, Radiation Laboratory.] May 14, 1941.
- M2** The aircraft radio sight. (Report No. 374.) (n.a.) MIT, Radiation Laboratory. April 30, 1942.
- M3** The stability of blind firing systems. (Report No. GRU/M-8.) (n.a.) Gunnery Research Unit [Great Britain]. March 14, 1944.
- M4** Development and construction of a local turret gyrolead computing sight for airborne gunsight. (Report No. 268.) (n.a.) OEMsr-1149. General Electric Company. April 27, 1944.
- M5** Preliminary instruction manual for AN/APG-15. (Report Nos. M-178 and M-178B.) Bert W. Weber. OEMsr-262; Service Project No. SC-69. MIT,

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- M6** The Fairchild central station computer. The Fairchild .50 caliber M-2 computer and airborne gunsight adaptations for an Emerson tail turret. (Parts I and II. Report No. 433.) (n.a.) OEMsr-812; Service Project Nos. SC-102 and SC-69. Fairchild Camera and Instrument Corporation. April 30, 1945.
- M7** Handbook of maintenance instructions for the AN/APG-8 airborne radar gunsighting equipment. (Report No. M-214.) J. Vance Holdam, Jr. OEMsr-262; Service Project No. SC-69. MIT, Radiation Laboratory. May 18, 1945.
- M8** Preliminary instruction manual for AN/APG-15B. (Report No. M-215.) J. Vance Holdam, Jr. OEMsr-262; Service Project No. SC-69. MIT, Radiation Laboratory. June 1, 1945.
- M9** Range and tracking accuracy of AN/APG-15B. (Report No. 875.) C. T. Bumer. OEMsr-262; Service Project No. AC-235.02. MIT, Radiation Laboratory. March 22, 1946.

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- M2** The Sperry stabilized aircraft gun laying system, intermediate phase. (Report No. 289.) (n.a.) Sperry Gyroscope Company, Inc. May, 1944.
- M3** [The] 2-CH1A1 (AGL-1) aircraft fire control computer. (Report No. 570.) Dan L. Colbath. OEMsr-233. General Electric Company. November 16, 1945.
- M4** [Radar gun-laying system.] (Report No. 385.) (n.a.) OEMsr-233. General Electric Company. (n.d.)

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- M1** Project Falcon. Air-to-surface vessel radar range for 75-mm cannon in B-25. (Report No. 91.) Carl F. J. Overhage. MIT, Radiation Laboratory. December 15, 1943.
- M2** Project Falcon. [The] AN/APG-13. (Report No. 91.) Carl F. J. Overhage. MIT, Radiation Laboratory. January 24, 1944.
- M3** Falcon system manual. (Report No. M-152A.) H. T. Hodges. OEMsr-262. MIT, Radiation Laboratory. February 15, 1944.
- M4** [The] AN/APG-13, Falcon system, manual. (Report No. M-152B.) H. T. Hodges. OEMsr-262. MIT, Radiation Laboratory. March 31, 1944.
- M5** Lecture outline for course on AN/APG-13, Falcon. (Report No. 64.2.) Herbert H. Wheaton. MIT, Radiation Laboratory. August 3, 1944.
- M6** [The] AN/APG-13 system manual. (Report No. M-152C.) H. T. Hodges. Revised by E. A. Slusser. OEMsr-262; Service Project No. SC-103. MIT, Radiation Laboratory. August 8, 1944.
- M7** Computer Mark 14, AN/APA-30 XN-1 instruction

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- M8** Overland Falcon. (Report No. 647.) E. H. B. Bartelink. OEMsr-262; Service Project Nos. AC-81 and NA-205. MIT, Radiation Laboratory. February 7, 1945.

- M9** The AN/APG-21, Terry. (Report No. 794.) E. A. Slusser. OEMsr-262; Service Project Nos. AC-235.01 and NA-205. MIT, Radiation Laboratory. August 25, 1945.

- M10** Preliminary instructions for radar set AN/APG-13B. (Report No. M-246.) M. Boas. OEMsr-262; Service Project No. AC-235.01. MIT, Radiation Laboratory. September 15, 1945.

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- M13** [The] AN/APG-21, Terry. E. A. Slusser. [MIT, Radiation Laboratory.] (n.d.)

- M14** Letters discussing ASP-25 and related ideas [concerning] ASH. E. H. B. Bartelink. MIT, Radiation Laboratory. (n.d.)

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- M1** Data on SCR-584 control equipment. (Report No. 370.) G. J. Plain and S. Godet. MIT, Radiation Laboratory. December 17, 1942.

- M2** Notes on the stability of Village Inn Mark I and on means of improving it. (Fire Control Section Memorandum No. 97. Report No. Arm. S. 1031/-B/AAH/99.) (n.a.) Royal Aircraft Establishment, Armament Department [Great Britain]. June, 1944.

- M3** Notes on a method of obtaining operational stability in airborne gun laying Mark I GGS systems. (Fire Control Memorandum No. 98 and Arm. S. 1031/J/AAH/MH/135.) (n.a.) [Royal Aircraft Establishment, Great Britain.] July, 1944.

- M4** [The] T-5 field chronograph for SCR-584. (Report No. 968.) Israel H. Sudman. OEMsr-262. MIT, Radiation Laboratory. March 15, 1946.

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- M2** Accuracy criteria for the gun director, Mark 56. (Report No. 578.) Ralph S. Phillips and C. H. Dowker. OEMsr-262; Service Project No. NO-166. MIT, Radiation Laboratory. June 9, 1944.

- M3** Analysis of tracking data. Description of calculations. (Report No. 628.) P. A. Samuelson. OEMsr-262. MIT, Radiation Laboratory. October 3, 1944.

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- M5** Tests on the performance of the Mark I, Model 7 computer. (Report No. 677.) P. R. Weiss. OEMsr-262. MIT, Radiation Laboratory. April 24, 1945.

- M6** Preliminary instructions for radar system, Mark 35. (Report No. M-240.) M. Boas. OEMsr-262; Service Project No. NA-166. MIT, Radiation Laboratory. November 30, 1945.

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- M9** Slip-ring assembly for Mark 56 director. (Report No. 877.) E. J. Scott. OEMsr-262. MIT, Radiation Laboratory. March 26, 1946.

- M10** [The] Mark 56-U chronograph. (Report No. 805.) Israel H. Sudman. OEMsr-262. MIT, Radiation Laboratory. April 18, 1946.

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- M2** A brief description of AN/TPG-1, AN/FPG-1 and SCR-598, developmental seacoast gun laying radar sets. (Report No. 456.) (n.a.) MIT, Radiation Laboratory. October 8, 1943.

- M3** Preliminary technical instruction book for radio set SCR-584. (Report No. M-132.) (n.a.) MIT, Radiation Laboratory. (n.d.)

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- M1** Project Dolphin. (Report No. 385.) Gordon F. Duvall. MIT, Radiation Laboratory. May 29, 1943.

- M2** Motor torpedo boat computing radar sight. (Report No. S-14.) Gordon F. Duvall. OEMsr-262. MIT, Radiation Laboratory. April 10, 1944.

- M3** Dolphin, remotely controlled torpedo rack actuating mechanism. (Report No. S-23.) Gordon F. Duvall. OEMsr-262; Service Project No. NO-172. MIT, Radiation Laboratory. August 29, 1944.

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M5 Torpedo rack alignment kit Mark I, Model O. (Report No. S-42.) Gordon F. Duvall. OEMsr-262; Service Project No. NO-172. MIT, Radiation Laboratory. March 17, 1945.

M6 Tables for use with torpedo director, Mark 33-1. Tracking timing tables, collision course bearing turn tables, target speed determination tables, salvo tables for blind fire. (Parts I to IV.) Report No. S-60.) (n.a.) MIT, Radiation Laboratory. June 29, 1945.

M7 Torpedo director Mark 33, Model 1. (Report No. S-63.) Gordon F. Duvall and R. G. Page. OEMsr-262. MIT, Radiation Laboratory. November 30, 1945.

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M2 The California Institute of Technology aircraft rocket sight, Type 2. (Division 3. Report No. CIT/JNC-23.) H. W. Babcock. OEMsr-418; Service Project No. NO-216; OSRD No. 2263. California Institute of Technology. October 15, 1944.

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M4 Forward firing of rockets from P-51K aircraft. (Division 3. Report No. CIT/JNC-26.) (n.a.) OEMsr-418; OSRD No. 2347. California Institute of Technology. February 10, 1945.

M5 Principles of rocket firing from aircraft. (Division 3. Report No. CIT/JNC-30.) (n.a.) OEMsr-418; OSRD No. 2428. California Institute of Technology. April 2, 1945.

M6 Fighter gunnery, rocket firing and dive bombing. (Manual No. 64.) (n.a.) US Army Air Forces, Fighter Gunnery School, Foster Field, Texas. May 1, 1945.

M7 Rocket sights. (Research Technical Report No. 10. Second Supplement.) L. T. E. Thompson. Lukas-Harold Corporation. June 30, 1945.

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418; OSRD No. 2290. California Institute of Technology. November 17, 1944.

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M2 Project TGI (AN/APX-11 [and] AN/APX-16). (Report No. 1081.) Jesse R. Lien. OEMsr-262. MIT, Radiation Laboratory. April 18, 1946.

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M2 Detection of propeller and Sambo modulations. (Report No. S-10.) James L. Lawson. OEMsr-262. MIT, Radiation Laboratory. May 16, 1944.

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M2 [The] S-band air-to-surface vessel marker. (Report No. 298.) J. S. Kirby-Smith. MIT, Radiation Laboratory. March 27, 1943.

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M3 A simple trainer for GCA approach controller. (Report No. 669.) C. M. Gilbert, G. F. Tape and C. R. Haupt. OEMsr-262; Service Project No. NA-141. MIT, Radiation Laboratory. January 24, 1945.

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326 Aircraft Interception

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- M3** Indicator components as used in a complete aircraft interception installation. (Report No. 138.) W. A. Higinbotham. MIT, Radiation Laboratory. April 20, 1942.
- M4** Some factors governing the range of aircraft interception sets. (Report No. 91.) T. W. Bonner. MIT, Radiation Laboratory. May 3, 1944.
- M5** Tests of a Type C data presentation with a spiral-scan aircraft interception system. (Report No. 767.) Eugene W. Cowan, Jr. OEMsr-262. MIT, Radiation Laboratory. July 8, 1945.

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- M1** Night fighter pursuits. (Report No. 117.) Hubert M. James. MIT, Radiation Laboratory. June 13, 1941.
- M2** Airborne 3-cm radar equipment for aircraft interception and air-to-surface vessel applications. (Report No. 27.) N. F. Ramsey. MIT, Radiation Laboratory. May 22, 1942.
- M3** A new approach procedure for night fighting. (Report No. 178.) Hubert M. James. MIT, Radiation Laboratory. June 26, 1942.
- M4** A new method in night fighting. (Report No. 178a.) Hubert M. James. MIT, Radiation Laboratory. June 30, 1942.
- M5** Effect of routine evasive action on the calculated approach procedure. (Report No. 187. Supplement to Report No. 43-5.) Hubert M. James. MIT, Radiation Laboratory. December 16, 1942.
- M6** Use of the range clock in night fighting with aircraft interception equipment. (Report No. 204.) Hubert M. James. MIT, Radiation Laboratory. April 28, 1943.
- M7** Flight tests on AN/APS-6A. (Report No. S-25.) R. M. Alexander. OEMsr-262; Service Project Nos. NA-125 and NS-171. MIT, Radiation Laboratory. November 30, 1944.

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- M1** Precise navigation by means of a radar map superposed on the plan position indicator. (Report No. 503.) Edward E. Miller and D. B. McLaughlin. OEMsr-262. MIT, Radiation Laboratory. April 7, 1944.
- M2** A microfilm chart projector for radar navigation. (Report No. 658.) D. B. McLaughlin and C. A. Smith. OEMsr-262. MIT, Radiation Laboratory. January 23, 1945.
- M3** US radar survey. Section 4, Navigational radar. (n.a.) June 15, 1945.
- M4** The future of hyperbolic navigation. (Report No. 625.) J. A. Pierce. OEMsr-262; Service Project Nos. SC-56 and AN-18. MIT, Radiation Laboratory. August 18, 1945.
- M5** A navigational radar for naval auxiliaries and merchant marine. (Report No. 876.) R. M. Ember-

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327.1 Loran

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- M2** Airborne loran equipment. (Report No. 191.) A. F. Bischoff. OEMsr-723. General Electric Company. September 1, 1943.
- M3** Elements of loran. (Report No. 499.) B. W. Sitterly. OEMsr-262. MIT, Radiation Laboratory. March 8, 1944.
- M4** Notes on the European and Eastern Atlantic sky-wave synchronized loran systems. (BBRL Reference No. 83.) R. H. Woodward and Wendell Lees. British Branch Radiation Laboratory. April 17, 1945.
- M5** Manual of procedures for mobile charting units, air transportable loran system. (Report No. M-183.) B. W. Sitterly. MIT, Radiation Laboratory. March 30, 1946.

327.11 Equipment

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- M2** [Lodar, pulse and direction finding receiver.] Report on Project PDrc-1. (Report No. 200.) Garrard Mountjoy. Radio Corporation of America. April 29, 1943.
- M3** Simplified loran receiving equipment. (Report No. 228.) Garrard Mountjoy, Earl Schoenfeld and George D. Hulst, Jr. OEMsr-977; Service Project No. SC-56. Radio Corporation of America. June 25, 1943.
- M4** Characteristics of simplified loran receiving equipment. (Report No. 206.) Garrard Mountjoy, Earl Schoenfeld and others. Radio Corporation of America. November 11, 1943.
- M5** A portable signal generator for loran receivers. (Report No. 297.) Garrard Mountjoy, Earl Schoenfeld and others. Radio Corporation of America. June 27, 1944.
- M6** Instruction book for Western Electric D-161131 receiver and Western Electric D-161132 indicator. (Report No. 91.) (n.a.) NDCrc-205. Western Electric Company, Inc. and Bell Telephone Laboratories, Inc. (n.d.)

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- M1** Western Electric D-160448 input equipment and Western Electric X-61901 oscilloscope. (Report No. 87.) (n.a.) OEMsr-2. Bell Telephone Laboratories, Inc. November, 1941.
- M2** Two-megawatt transmitter for NDRC Project No.

3. (Report No. 92.) (n.a.) OEMsr-9. General Electric Company. December 9, 1941.

M3 Lightweight loran transmitter, LLTX. (Report No. M-158A.) A. A. McKenzie. OEMsr-262. MIT, Radiation Laboratory. April 3, 1944.

M4 Harvey 170-T loran transmitter manual. (Report No. M-162.) A. A. McKenzie. OEMsr-262. MIT, Radiation Laboratory. May 10, 1944.

M5 An exciter for low-frequency loran transmitter. (Report No. 459.) Earl Schoenfeld, William Brown and others. OEMsr-977; Service Project No. SC-56. Radio Corporation of America. June 8, 1945.

M6 An improved type of low-frequency loran transmitter. (Report No. 458.) (n.a.) OEMsr-977; Service Project No. SC-56. Radio Corporation of America. June 29, 1945.

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M1 A converter for 170-kc loran signals. (Report No. 329.) Earl Schoenfeld, George D. Hulst, Jr. and William Brown. Radio Corporation of America. October 20, 1944.

M2 Handbook of operating instructions for loran low-frequency converter, CV-27/UPN. (Report No. M-222.) A. A. McKenzie. OEMsr-262; Service Project Nos. SC-56 and AN-18. MIT, Radiation Laboratory. April 27, 1945.

M3 Handbook of maintenance instructions for loran low-frequency converter, CV-27/UPN. (Report No. M-225.) A. A. McKenzie. OEMsr-262; Service Project Nos. SC-56 and AN-18. MIT, Radiation Laboratory. July 6, 1945.

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M2 Interference of loran pulse signals with radio telephone and telegraph reception. (Report No. 163.) (n.a.) OEMsr-777. Bell Telephone Laboratories, Inc. March 4, 1943.

M3 Third Report on [the] Crystal Clock Project. (Report No. 145.) [W. C. Elmore.] OEMsr-821. [Bartol Research Foundation.] May 1, 1943.

M4 Fourth Report on the Crystal Clock Project. Preliminary report on 10-kc oscillator. (Report No. 175.) [W. C. Elmore.] OEMsr-821. Bartol Research Foundation. August 1, 1943.

M5 Fifth Report on the Crystal Clock Project. Report on 10-kc L-C oscillator. (Report No. 193.) [W. C. Elmore.] OEMsr-821. Bartol Research Foundation. October 1, 1943.

M6 Final Report on the Crystal Clock Project. The 10-kc L-C oscillator. (Report No. 226.) [W. C. Elmore.] OEMsr-821. Bartol Research Foundation. January 1, 1944.

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pling units at frequencies between 1700 and 2000 kilocycles. (Report No. 511.) A. J. Poté. OEMsr-262. MIT, Radiation Laboratory. February 20, 1944.

M8 Special mechanical counter for the Mark III or phase-shift loran indicator. (Report No. 368.) (n.a.) OEMsr-1338; Service Project No. SC-56. International Business Machines Corporation. October 18, 1944.

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M2 Proposal for extending the range of shoran by the use of ground position indicator. (Report No. 20.) W. J. Tull. MIT, Radiation Laboratory. July 20, 1945.

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M1 Notes on the Rebecca-H system from information obtained at Telecommunications Research Establishment [Great Britain] July, 1943. Arthur Roberts. MIT, Radiation Laboratory. August 25, 1943.

328 Beacons

M1 Overinterrogation control of microwave beacons. (Report No. 477.) Israel H. Sudman. MIT, Radiation Laboratory. December 11, 1943.

M2 Siting and range of microwave beacons. (Report No. 590.) W. M. Preston. OEMsr-262. MIT, Radiation Laboratory. July 5, 1944.

M3 The statistics of beacon interrogation. (Report No. 602.) H. H. Bailey. OEMsr-262. MIT, Radiation Laboratory. February 5, 1945.

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328.11 Ground

328.111 X-Band

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M2 Handbook for Model CXEH radar beacon and associated test equipment. (Report No. M-129B.) Edited by: J. R. Dorsey. OEMsr-262. MIT, Radiation Laboratory. February, 1944.

M3 Video stretching as a method for improving X-band beacon reception. (Report No. 604.) T. H. Waterman and S. D. Bennett. OEMsr-262; Service Project Nos. NS-228 and NO-214. MIT, Radiation Laboratory. August 31, 1944.

M4 Ultraportable racon, BUPX. (Report No. 407.) P. J. Herbst. OEMsr-684. Radio Corporation of America. November 30, 1944.

M5 Preliminary instruction manual for X-band coincident beacon, XCB (Mark I) AN/APX-14. (Report No. M-199.) Jesse R. Lien. OEMsr-262. MIT, Radiation Laboratory. March 1, 1945.

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- M8** The BUPX. (Report No. 1054.) H. H. Bailey. OEMsr-262. MIT, Radiation Laboratory. April 8, 1946.

328.112 S-Band

- M1** [The] BGS 10-cm radar beacon. (Report No. 358.) Robert M. Whitmer and James M. Cunningham. MIT, Radiation Laboratory. June 1, 1943.
- M2** Preliminary handbook for experimental prototype-model radio set, SCR-620. (Report No. M-161.) (n.a.) MIT, Radiation Laboratory. March, 1943.
- M3** A racon prospectus with a pictorial brief of BGS experimental SCR-620 racon installation. (Report No. 357.) Arthur Roberts and Robert M. Whitmer. MIT, Radiation Laboratory. 1944.
- M4** Preliminary manual for radar beacon, Type BPS. (Report No. M-130.) Edited by: Lionel H. Orpin. OEMsr-262. MIT, Radiation Laboratory. January 3, 1944.

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- M2** Beacon tests with AN/APS-6. (Report No. S-16.) R. M. Alexander. OEMsr-262; Service Project No. NA-125. MIT, Radiation Laboratory. June 2, 1944.
- M3** Results of tests on use of Rebecca-Eureka by the [US] Army Ground Forces. (Report No. 500.) R. F. Rollman. OEMsr-262. MIT, Radiation Laboratory. July 26, 1944.
- M4** Development work on AN/PPN-2 radio set. (Report No. 434.) D. H. Mitchell. OEMsr-918. Galvin Manufacturing Corporation. April 6, 1945.

328.12 Airborne

328.121 S-Band

- M1** Rosebud, microwave beacon equipment. (Report No. 460.) R. T. McCoy. MIT, Radiation Laboratory. October 1, 1943.
- M2** Maintenance manual for the AN/APN-7 system modified for the SG-band. (Report No. M-170.) D. J. Dickinson and J. J. Guarrera. OEMsr-262;

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- M4** An airborne S-band racon for Rooster operation. (Report No. 554.) E. R. Gaerttner. OEMsr-262; Service Project No. SC-63. MIT, Radiation Laboratory. June 28, 1944.
- M5** Florida tests on Rosebups against SCR-582, SCR-615 and microwave early warning [radar]. (Report No. 596.) R. P. Ghelardi. OEMsr-262; Service Project No. SC-63.04. MIT, Radiation Laboratory. July 27, 1944.
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- M2** Preliminary instruction book [for the] shore bombardment beacon, Navy Model Mark 2, Model 0 and Model 1. (Report No. M-185.) John C. Reed. OEMsr-262. MIT, Radiation Laboratory. October 31, 1944.

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329 Bombing and Guided Missiles

329.1 Bombing

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M2 Interconnecting AN/APA-5 and army radar sets. (Report No. S-30.) J. X. Mulvey, Jr. OEMsr-262; Service Project No. AN-7. MIT, Radiation Laboratory. October 2, 1944.

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M2 The AN/APS-32 [system]. (Report No. 763-2.) George F. Wheeler and D. Halliday. OEMsr-262; Service Project Nos. AN-21 and NS-314. MIT, Radiation Laboratory. September 25, 1945.

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- M2** Errors arising from the use of a repeater aircraft with Oboe. (Report No. T-1448.) (n.a.) OSRD Liaison Office No. WA-813-8N. Telecommunications Research Establishment [Great Britain]. April 30, 1943.
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- M4** Handbook of instructions for AN/APA-9, ASPEN, radar set. (Second abbreviated edition. Report No. M-148B.) (n.a.) MIT, Radiation Laboratory. December 21, 1943.
- M5** Instructions for modifying the SCR-584 modulator for use in ASPEN transmitters. (Report No. M-155A.) A. S. Jerrems and L. A. Ames. OEMsr-262. MIT, Radiation Laboratory. January 25, 1944.
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- M9** ASPEN airborne antenna. (Report No. 519.) Henry J. Riblet. OEMsr-262; Service Project No. SC-76. MIT, Radiation Laboratory. August 25, 1944.
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- 329.141 Antenna**
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- M2** Double reflector antenna for high-altitude bombing. (Report No. 775.) E. B. Chisholm and B. R. Vogel. OEMsr-262. MIT, Radiation Laboratory. July 16, 1945.
- M3** [A] K-band antenna for high-altitude bombing. (Report No. 789.) A. S. Dunbar and E. B. Chisholm. Service Project Nos. AC-232.10, AC-232.02 and AN-24. MIT, Radiation Laboratory. December 26, 1945.
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- M2** A mechanical integrating system incorporating a magnetic amplifier. (Report No. 436.) H. S. Sack and J. W. Trischka. OEMsr-768. Cornell University. December 15, 1944.
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- M2** Unified radar bombsight, URBS. E. B. Meservey. OEMsr-262. MIT, Radiation Laboratory. July 31, 1945.
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- M2** An H+B impact predicting computer assuming constant indicated airspeed, for use with AN/APS-15a radar. (Report No. 584.) R. N. Close. OEMsr-262; Service Project Nos. SC-36 and NS-229. MIT, Radiation Laboratory. June 23, 1944.
- 329.145 Vixen Adapter**
- M1** Vixen X. (Report No. 607.) M. M. Mann, Francis T. Worrell and F. Shoemaker. OEMsr-262; Service Project No. NA-173. MIT, Radiation Laboratory. December 15, 1944.
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- M2** Statistical reports on radar bombing. C. E. Duncan and Gorman E. Turner. US Army Air Forces, Second Air Force, Colorado Springs, Colorado. May 26, 1945.
- M3** Bombing accuracy of radar personnel of 315th and 316th Bomb Wings in training at Victorville. (n.a.) US Army Air Forces, Statistical Control Office. [July, 1945.]
- M4** Radar bomb scoring analysis. (Report No. 23.) Bernard Vinograde. US Army Air Forces, Second Air Force, Operations and Training Division, Colorado Springs, Colorado. September 14, 1945.
- 329.151 Photographic**
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Plans and Analysis Section, Department of Training and Operations, Victorville Army Air Field. April 1, 1945.

- M2** A photographic method for assessment of bombing results. (Report No. 939.) George F. Wheeler. OEMsr-262. MIT, Radiation Laboratory. February 28, 1946.

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- M2** Interference between SCR-584's tracking APN-19 beacons. (Report No. 816.) C. H. Dowker. OEMsr-262. MIT, Radiation Laboratory. September 18, 1945.

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- M1** General technique for bombing stationary or moving targets. (Report No. 3.) H. S. Morton. US Army, Ordnance Department. February 22, 1943.
- M2** Preliminary mathematical analysis of toss bombing. (Report No. 2.) H. S. Morton. US Army, Ordnance Department. April 1, 1943.
- M3** Equations for toss bombing for the horizontal case, assuming acceleration is a function of the time. (Division 4. Report No. OD-TB-19.) William B. McLean. National Bureau of Standards. August 31, 1944.
- M4** Toss-bombing trajectories. (Division 4. Report No. OD-OAG-32.) F. L. Celauro and D. Fisher. [National Bureau of Standards.] September 6, 1944.
- M5** Effect of changing integrator RC ratio to correct for an error in alignment of sight with line of flight. (Division 4. Report No. OD-SP-40.) William B. McLean. National Bureau of Standards. October 26, 1944.
- M6** General toss-bombing solution for the case of a non-constant acceleration, including the effect of the pull-up angle. (Division 4. Report No. OD-SP-48.) Albert London. National Bureau of Standards. November 3, 1944.
- M7** Analysis of horizontal range error resulting from neglect of pull-up angle. (Division 4. Report No. OD-SP-45.) S. H. Lachenbruch. National Bureau of Standards. November 7, 1944.
- M8** Use of the 100-ft horizontal error curves for errors of other magnitudes. (Division 4. Report No. OD-SP-46.) S. H. Lachenbruch. National Bureau of Standards. November 8, 1944.
- M9** Relationships among important angles in toss-bombing trajectories. (Division 4. Report No. OD-SP-49.) S. H. Lachenbruch. National Bureau of Standards. November 10, 1944.
- M10** The elements of toss bombing. (Technical Paper No. REI-TMD-115. Revision 1.) Irvin H. Swift.

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- M11** Application of toss-bombing equipment to torpedo tossing. (Division 4. Report No. OD-SP-56.) Albert London. National Bureau of Standards. November 28, 1944.
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- M14** New Ψ card design. (Division 4. Report No. OD-SP-78.) Albert London and A. E. Willgoos. National Bureau of Standards. January 17, 1945.
- M15** Rocket tossing theory. (Division 4. Report No. OD-SP-90.) Albert London and C. F. Eve. National Bureau of Standards. February 24, 1945.
- M16** Exact solution of toss-bombing equations for circular pull-up. (Division 4. Report No. OD-SP-98.) S. H. Lachenbruch, Albert London and C. F. Eve. National Bureau of Standards. March 23, 1945.
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- M19** Toss bombing. (Research Technical Report No. 16.) L. T. E. Thompson. Indianapolis Naval Ordnance Plant and Lukas-Harold Corporation. June 30, 1945.
- M20** [The] Ψ function for non-constant pull-up acceleration. (Division 4. Report No. OD-SP-123.) C. F. Eve and Albert London. National Bureau of Standards. July 10, 1945.
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- M2** . . . [the] SRB_s. (Final Report No. 403.) R. E. Hillger. MIT, Radiation Laboratory. September 3, 1943.
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400 TRAINING

410 Trainers

411 Types

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M2 Preliminary handbook of instructions for supersonic trainer, AN/APQ-7-T1, Eagle trainer. (Report No. M-189.) Walter R. Carmody. OEMsr-262; Service Project Nos. AC-1 and SC-62.10. MIT, Radiation Laboratory. June 14, 1945.

M3 Radar training conference [at] Victorville Army Air Field, Victorville, California, July 24 and 25, 1945. Robert H. Lewis. US Army Air Forces, Headquarters, Victorville Army Air Field. August 1, 1945.

M4 Ground course computer for AN/APQ-T1. (Report No. 856.) C. M. Gilbert. OEMsr-262; Service Project No. AC-262-14. MIT, Radiation Laboratory. January 21, 1946.

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M1 Preliminary handbook of instructions for H₂X supersonic trainer, Mark II. (Report No. M-157a.) A. E. Caswell. OEMsr-262; Service Project Nos. NA-160 and SC-62.09. MIT, Radiation Laboratory. April, 1944.

M2 Handbook of instructions for the preparation of maps for the H₂X supersonic trainer. (Report No. M-181.) Walter R. Carmody. OEMsr-262; Service Project Nos. NA-160 and SC-62.09. MIT, Radiation Laboratory. September, 1944.

M3 Preliminary handbook of instructions for H₂X supersonic trainer, Mark III. (Report No. M-157B.)

Walter R. Carmody. OEMsr-262; Service Project Nos. NA-160 and SC-26.09. MIT, Radiation Laboratory. September 30, 1944.

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411.2 Aircraft Interception and Fire Control

411.21 AI-10 Trainers

M1 AI-10 bench trainer simulation at video level. (Report No. 398.) R. L. Garman. MIT, Radiation Laboratory. August 24, 1942.

M2 AI-10 trainer simulation at intermediate frequency level. (Report No. 397.) R. L. Garman. MIT, Radiation Laboratory. August 25, 1942.

411.22 AN/APG Trainers

M1 Preliminary technical manual for Falcon Trainer, AN/APG-13T1. (Report No. M-182.) Wilfred Roth and W. N. Simonds, Jr. OEMsr-262; Service Project Nos. SC-57, SC-62.12 and NA-186. MIT, Radiation Laboratory. October 20, 1944.

M2 Handbook of maintenance instructions for AN/APG-15-T1 trainer. (Report No. M-221.) A. E. Caswell. OEMsr-262; Service Project Nos. SC-62.11 and SC-69. MIT, Radiation Laboratory. June 23, 1945.

M3 [The] AN/APG-T1 training equipment. (Report No. 759-1.) George R. Paine. OEMsr-262; Service Project No. SC-62.07. MIT, Radiation Laboratory. July 28, 1945.

M4 [The] AN/APG-15 modification kit for AN/APG-T1 training equipment. (Report No. 759-2.) George R. Paine. OEMsr-262; Service Project Nos. AC-235.02 and SC-62.07. MIT, Radiation Laboratory. August 30, 1945.

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M2 The trainer for radio set AN/MPN-1. (Report No. 676.) C. R. Haupt. OEMsr-262; Service Project

No. NA-141. MIT, Radiation Laboratory. May 25, 1945.

- M3** Two proposed methods of recording the position of a moving Link Crab. (Report No. 730.) Gordon W. McClure. OEMsr-262. MIT, Radiation Laboratory. June 20, 1945.

- M4** A tracking error recorder for the ground-controlled approach trainer. (Report No. 855.) C. M. Gilbert and C. R. Haupt. OEMsr-262. MIT, Radiation Laboratory. January 30, 1946.

- M5** Ground clutter unit for the ground-controlled approach trainer. (Report No. 927.) C. M. Gilbert. OEMsr-262. MIT, Radiation Laboratory. February 20, 1946.

- M6** Special ground-controlled approach trainer circuits. (Report No. 1057.) C. M. Gilbert. OEMsr-262. MIT, Radiation Laboratory. March 15, 1946.

411.4 Bomb Release

- M1** Training method and evaluation of the acceleration integrator bomb release. Stuart H. Getz. US Army Air Forces, Training Research and Liaison Section, Williams Field, Chandler, Arizona. November 27, 1945.

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- M2** [The] building of basic SCR-584 trainer and advanced SCR-584 trainer. (Report No. 372.) Wilfred H. Howe. OEMsr-689. Foxboro Company. January 24, 1944.

- M3** Handbook of instructions for the pre-production SSV trainer. (Report No. M-160.) (n.a.) OEMsr-262. MIT, Radiation Laboratory. March 15, 1944.

- M4** [The] SM trainer. (Report No. 371.) M. L. Levy. OEMsr-890. Emerson Radio and Phonograph Corporation. October 9, 1944.

- M5** [Trainers.] Technical report reviewing the history of Contract OEMsr-1091. (Report No. 442.) E. L. Russell. OEMsr-1091. Wilcox and Gibbs Sewing Machine Company. February 14, 1945.

- M6** Supersonic loran trainer. (Report No. 446.) J. F. Marshall, W. F. G. Swann and others. OEMsr-1220. Bartol Research Foundation. June 4, 1945.

- M7** A dummy log transmitter for the OBJ radar trainer. (Report No. 1059.) R. U. Nathe. OEMsr-262. MIT, Radiation Laboratory. February 25, 1946.

- M8** The OCJ-1 trainer. (Report No. 1058.) Gordon W. McClure. OEMsr-262. MIT, Radiation Laboratory. March 25, 1946.

- M9** Trainer for Mark 35 radar. (Report No. 907.) H. O. Marcy. OEMsr-262. MIT, Radiation Laboratory. April 5, 1946.

- M10** The SP feed-in trainer. (Report No. 928.) S. B.

Cohen. OEMsr-262; Service Project No. NA-128. MIT, Radiation Laboratory. April 10, 1946.

- M11** The Cadillac trainer. (Report No. 1072.) E. M. Jones. OEMsr-262. MIT, Radiation Laboratory. April 10, 1946.

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Components

- M1** Land/ mass simulator. (Report No. 399.) R. L. Garman. MIT, Radiation Laboratory. August 26, 1942.

- M2** Fading simulator. (Report No. 556.) Wilfred Roth. OEMsr-262; Service Project No. SC-62. MIT, Radiation Laboratory. May 10, 1944.

- M3** The J-2 modulator unit. (Report No. 645-5.) E. M. Jones. OEMsr-262. MIT, Radiation Laboratory. July 19, 1945.

- M4** [The] AN/APS-6 antenna simulator. (Report No. 839.) Gordon W. McClure. OEMsr-262. MIT, Radiation Laboratory. November 15, 1945.

- M5** [The] X-1 error integrator. (Report No. 645-13.) Wayne K. Hodder and Wilfred Roth. OEMsr-262. MIT, Radiation Laboratory. November 27, 1945.

- M6** The ML-1A, ML-1B and ML-3A course mechanisms. (Report No. 645-9.) C. M. Connelly and J. B. Higley. OEMsr-262. MIT, Radiation Laboratory. November 28, 1945.

- M7** Nosmo doppler simulator. (Report No. 857.) Wilfred Roth. OEMsr-262. MIT, Radiation Laboratory. February 1, 1946.

- M8** [The] N-1 identification friend-or-foe unit. (Report No. 645-14.) Gordon W. McClure. OEMsr-262. MIT, Radiation Laboratory. March 22, 1946.

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Signal Unit

- M1** The I-3 signal unit. (Report No. 645-4.) S. B. Cohen. OEMsr-262. MIT, Radiation Laboratory. May 23, 1945.

- M2** The I-2 signal unit. (Report No. 645-7.) S. B. Cohen. OEMsr-262. MIT, Radiation Laboratory. August 30, 1945.

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Trigger Unit

- M1** [The] H-3 trigger unit. (Report No. 645-3.) S. B. Cohen. OEMsr-262. MIT, Radiation Laboratory. February 22, 1945.

- M2** The H-2 trigger unit. (Report No. 645-6.) S. B. Cohen. OEMsr-262. MIT, Radiation Laboratory. August 7, 1945.

412.3

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- M1** [The] S-2, S-2B, S-3, S-4 and S-4B motor control units. (Report No. 645-10.) C. M. Gilbert. OEMsr-262. MIT, Radiation Laboratory. February 11, 1946.

- M2** The S-5 and S-5B motor control units. (Report No. 645-11.) J. B. Higley. OEMsr-262. MIT, Radiation Laboratory. February 25, 1946.

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- M2** Apparatus for the transformation of rectangular coordinates using Arma resolvers. (Report No. 293.) Paul B. Weisz and B. L. Miller. OEMsr-1220. Bartol Research Foundation. July 10, 1944.

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421 Types

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422 Components

422.1 Crystals

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- M5** The R-1 and the R-2 crystal drivers. (Report No. 645-8.) S. Frankel. OEMsr-262. MIT, Radiation Laboratory. February 4, 1946.
- M6** Supersonic components for use in radar trainers. (Report No. 1050.) S. Frankel and Paul Rosenberg. OEMsr-262. MIT, Radiation Laboratory. March 25, 1946.

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- M3** Navy Roof. (Report No. 39.) (n.a.) MIT, Radiation Laboratory. August 26, 1941.
- M4** The Maintenance Group. (Report Nos. 60 and 61.) (n.a.) MIT, Radiation Laboratory. October 22 and November 26, 1941.
- M5** Present status of the Radiation Laboratory program. (Report No. 32.) L. A. DuBridge. MIT, Radiation Laboratory. January 12, 1942.
- M6** Summary of projects, Division D, NDRC. (Report No. 95.) (n.a.) MIT, Radiation Laboratory. August 15, 1942.
- M7** Present status of the Radiation Laboratory program. Systems development. (Report Nos. 33-1 to 33-6.) (n.a.) MIT, Radiation Laboratory. December 9, 1942 to July 1, 1943.
- M8** Summary of projects, Radar Division 14. (Report Nos. 118, 124 and 141.) (n.a.) January, March and May, 1943.
- M9** Bi-monthly project status report and summary of projects. (Report Nos. 170, 184 and 213.) (n.a.) July, September and November, 1943.
- M10** The Microwave Antenna Conference, July 19 to 24, 1943. (Report No. 414.) L. C. Van Atta and G. G. Harvey. MIT, Radiation Laboratory. August 12, 1943.
- M11** Radar system projects. Class 20, Ground based radars other than racons and aircraft landing radars. (Report Nos. 238, 242, 277, 301, 338, 373, 400, 420, 440 and 489 [for the period from] February 1, 1944 [to] August 1, 1945. (n.a.)
- M12** Radar research projects. Class 00, Fundamental research, theory, propagation [and] fundamental developments. (Report Nos. 278, 388 and 463.) (n.a.) July 1, 1944, January 1, 1945 and July 1, 1945.
- M13** Thumbnail sketch for December [1944 through] May [1945]. (Report Nos. S-40, S-46 and S-53.) D. G. White. OEMsr-262. MIT, Radiation Laboratory. February 3, April 2 and May 30, 1945.
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- M2** Roof System report. (Report Nos. 36 and 37.) (n.a.) MIT, Radiation Laboratory. [April and September, 1941.]
- M3** Technical report of the Radiation Laboratory at the Massachusetts Institute of Technology. (Report No. 93.) (n.a.) MIT, Radiation Laboratory. June 1, 1941.

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- M2** Operations of the Project Tube Shop. (Report No. 248 [for the period] from April, 1942 through October, 1943.) J. M. Spooner. OEMsr-477. Radio Corporation of America. December 12, 1943.
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- M2** US radar survey. Section 7, Nomenclature index. (n.a.) December 15, 1944.
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- M1** Division 14 project list. (Report No. 188.) (n.a.) September 15, 1943.
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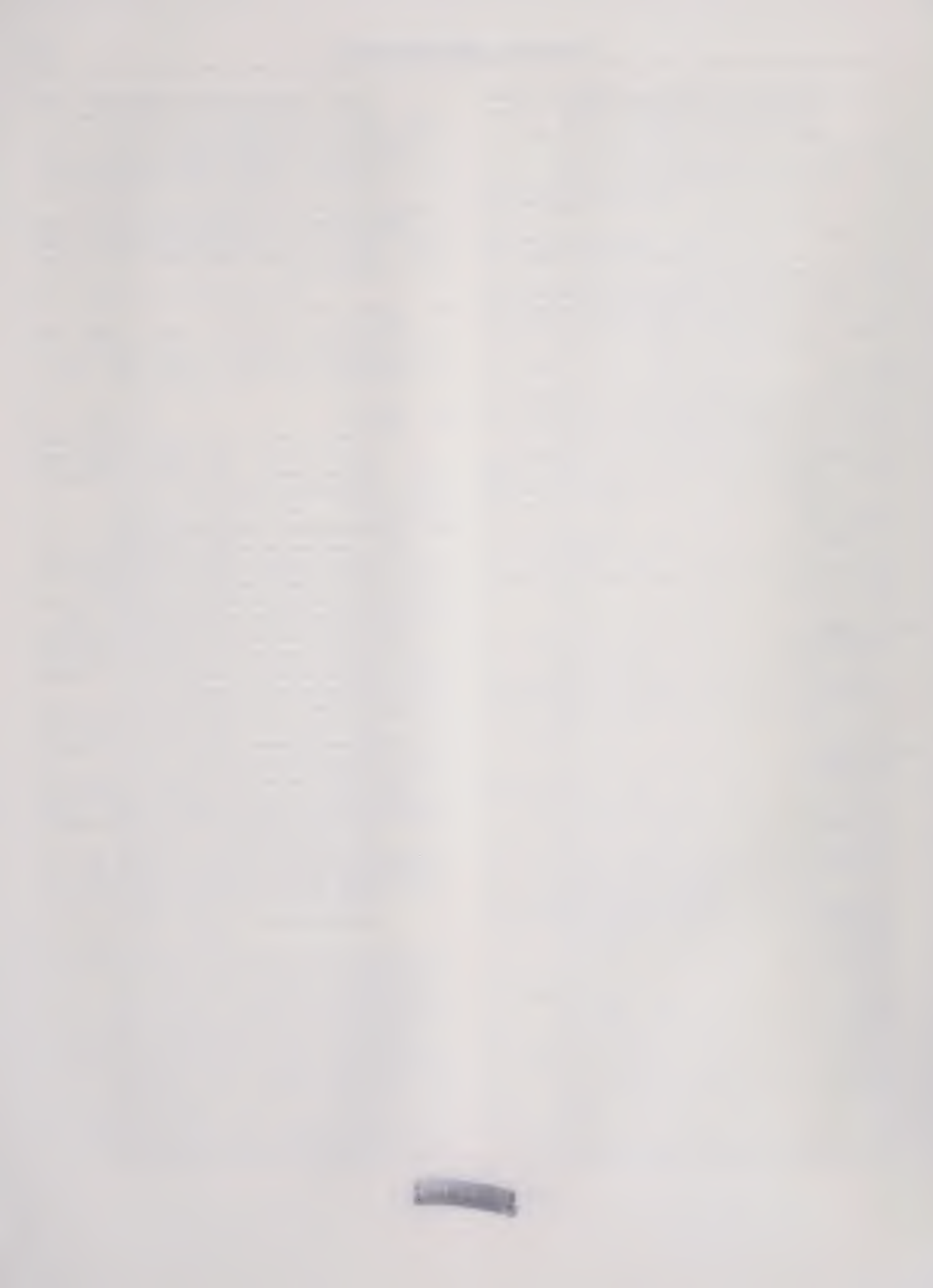
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- M1** A statistical treatment of certain phases of aerial combat. (Report No. 181.) Hubert M. James. MIT, Radiation Laboratory. July 30, 1942.
- M2** X-ray emission from radar equipment. (Report No. 157.) Leopold Rovner. January 15, 1943.
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- M9** Identification of pulse communication systems. (Preliminary Report No. 895-22.) John B. Atwood and Grant E. Hansell. OEMsr-895; Research Project No. RP-325. Radio Corporation of America. May 15, 1944.
- M10** Definitions and methods for jamming effectiveness testing in radio telephone countermeasures work. (Report No. 1024-8.) W. J. Albersheim, M. L. Almquist and others. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. July, 1944.
- M11** Use of J'/S ratio in radio frequency pulse jamming tests and results of vulnerability studies of an ARB receiver using the Goodyear limiter. (Report No. 1024-27.) Paul F. Hoffmann. OEMsr-1024; Project Nos. RP-189 and SC-93.01. Jansky and Bailey. July, 1945.
- M12** Vulnerability of radio receivers to jamming. (Final Report No. 1024-34.) Stuart L. Bailey and Delmer C. Ports. OEMsr-1024; Project Nos. RP-189, AC-203.01, NS-393.01 and others. Jansky and Bailey. December, 1945.
- 211.2 Jamming Susceptibility of Communications Systems**
- M1** A technique for conducting field jamming tests. (Report No. 966-50.) M. C. Francis. OEMsr-966; Project Nos. SC-95.08 and RP-272b. Bell Telephone Laboratories, Inc. April 20, 1945.
- 211.21 American Sets**
- M1** Memorandum concerning jamming vulnerability tests on six high-frequency amplitude modulated receivers. (Report No. 1024-21.) Paul F. Hoffmann. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. February, 1945.
- 211.211 Mobile and Portable Sets**
- M1** Tests made on Signal Corps receiver, BC-603-D. (Report No. 1024-4.) Oscar W. B. Reed, Jr. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. April, 1944.
- M2** Investigation of the vulnerability to jamming of the SCR-609-A radio set. (Report No. 1024-5.) Frank T. Mitchell, Jr. and Paul F. Hoffmann. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. May, 1944.
- M3** Investigation of the vulnerability to jamming of the SCR-300-A radio set. (Report No. 1024-9.) Paul F. Hoffmann. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. August, 1944.
- M4** Investigation of the vulnerability to jamming of the BC-342-N radio receiver, with supplement covering the BC-312-N receiver. (Report No. 1024-16.) Elmer H. Scheibe. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. December, 1944.
- M5** Investigation of the vulnerability to jamming of the radio receiver BC-652-A. (Report No. 1024-18.) Paul F. Hoffmann. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. January, 1945.
- M6** Investigation of the vulnerability to jamming of the radio receiver BC-669-C. (Report No. 1024-19.) Oscar W. B. Reed, Jr. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. January, 1945.
- M7** Investigation of the vulnerability to jamming of the radio receiver BC-654-A. (Report No. 1024-20.) Oscar W. B. Reed, Jr. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. January, 1945.
- M8** Investigation of the operating characteristics of radio set SCR-536. (Report No. 1024-22.) Elmer H. Scheibe. OEMsr-1024; Research Project No.

- RP-189. Jansky and Bailey. February, 1945.
- M9** Jamming characteristics of [the] AN/TRC-5 (XC-2) radio set. (Report No. 895-38.) Bertram A. Trevor. OEMsr-895; Project Nos. RP-460 and SC-93.02. Radio Corporation of America. May 29, 1945.
- M10** Investigation of the electrical characteristics and the vulnerability to jamming of the radio set SCR-511-B. (Report No. 1024-26.) Oscar W. B. Reed, Jr. OEMsr-1024; Project Nos. RP-189 and SC-93.01. Jansky and Bailey. June, 1945.
- M11** Electrical characteristics of radio set AN/TRC-8 (XC-3). (Report No. 1024-31.) Elmer H. Scheibe. OEMsr-1024; Project Nos. RP-189, AC-293.01 and SC-93.01. Jansky and Bailey. September, 1945.

211.212 Stationary Sets

- M1** Tests made on radio set AN/TRC-1 and associated equipment. (Report No. 1024-7.) Oscar W. B. Reed, Jr. and Elmer H. Scheibe. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. June, 1944.
- M2** Investigation of the vulnerability to jamming of the radio receiver BC-639-A. (Report No. 1024-11.) Oscar W. B. Reed, Jr. and Elmer H. Scheibe. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. September, 1944.
- M3** Susceptibility of American frequency-modulation communication equipment to jamming by mechanical frequency modulation barrage jammers. Test of SCR-608, SCR-609 and SCR-808. (Report No. 966-32.) V. A. Douglas. OEMsr-966; Research Project No. RP-109. Bell Telephone Laboratories, Inc. September 1, 1944.

211.213 Remote Control Sets

- M1** Investigation of the electrical characteristics and the vulnerability to jamming of the radio set AN/TRR-2. (Report No. 1024-29.) Oscar W. B. Reed, Jr. OEMsr-1024; Project Nos. RP-189 and SC-93.01. Jansky and Bailey. August, 1945.
- M2** Investigation of the vulnerability to jamming of the AN/SRW-2 (XA-1) receiver. (Report No. 1024-33.) Stuart L. Bailey. OEMsr-1024; Project Nos. RP-189, AC-293.01, SC-93.01 and NS-393.01. Jansky and Bailey. October, 1945.

211.214 Airborne Sets

- M1** The vulnerability to jamming of radio receiver BC-624-AM. (Final Report No. 1024-12.) Oscar W. B. Reed, Jr. and Elmer H. Scheibe. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. September, 1944.
- M2** Investigation of the vulnerability to jamming of the 233-A radio set. (Report No. 1024-10.) Oscar W. B. Reed, Jr. and Elmer H. Scheibe. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. October, 1944.
- M3** Comparison of the vulnerability to jamming of three amplitude modulation aircraft service radio receivers. (Report No. 1024-13.) Oscar W. B. Reed,

Jr. and Elmer H. Scheibe. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. October, 1944.

- M4** Investigation of the vulnerability to jamming of the radio receiver BC-348-R. (Report No. 1024-14.) Paul F. Hoffmann. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. November, 1944.
- M5** Investigation of the vulnerability to jamming of the original and modified AN/ARC-1 radio set. (Report No. 1024-23.) Elmer H. Scheibe. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. March, 1945.
- M6** Investigation of the vulnerability to jamming of aircraft receiver, Model ARB. (Report No. 1024-25.) Paul F. Hoffmann. OEMsr-1024; Project Nos. RP-189 and SC-93.01. Jansky and Bailey. May, 1945.

211.22 German Sets

- M1** A study of a particular scheme for communications jamming. (Technical Memorandum No. 411-23.) W. R. Rambo. OEMsr-411; Research Project No. RP-197. Harvard University, Radio Research Laboratory. November 1, 1943.
- M2** Vulnerability of the FuG 16 receiver to jamming of the Cigar type. (Report No. 1024-1.) Stuart L. Bailey. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. January, 1944.

211.23 Japanese Sets

- M1** Jamming susceptibility of the Japanese Model 99, Type Hi-3 radio set. (Report No. 966-41.) G. J. Heinzelman and J. L. Lindner. OEMsr-966; Research Project No. RP-109. Bell Telephone Laboratories, Inc. November 13, 1944.
- M2** Jamming susceptibility of the Japanese meteorological receiving set No. 775. (Report No. 966-42.) G. J. Heinzelman and J. L. Lindner. OEMsr-966; Research Project No. RP-109. Bell Telephone Laboratories, Inc. December 9, 1944.
- M3** Jamming susceptibility of the Japanese 99, Mark 4 very high frequency radio set. (Report No. 966-45.) G. J. Heinzelman. OEMsr-966; Research Project No. RP-966. Bell Telephone Laboratories, Inc. January 20, 1945.
- M4** Jamming susceptibility of the Japanese 94, Mark 5 receiver. (Report No. 966-46.) G. J. Heinzelman. OEMsr-966; Research Project No. RP-109. Bell Telephone Laboratories, Inc. February 7, 1945.
- M5** Jamming susceptibility of the Japanese radio set TM-305-C1. (Report No. 966-49.) G. J. Heinzelman and E. O. Bernard. OEMsr-966; Research Project No. RP-109. Bell Telephone Laboratories, Inc. February 8, 1945.
- M6** Program of investigation in connection with the deception of high-frequency Japanese direction finders. (Report No. 1458-1.) H. Busignies, A. G. Richardson and others. OEMsr-1458; Project Nos. RP-445 and SC-95.16. Federal Telephone and Radio Corporation. June 12, 1945.

- M7** Countermeasures against Japanese high-frequency direction finding. (Report No. 966-54.) K. L. Maurer. OEMsr-966; Project Nos. RP-422 and SC-95.16. Bell Telephone Laboratories, Inc. July 7, 1945.
- M8** Investigation of the vulnerability to jamming of the Model 96, Mark 4E Japanese transmitter-receiver. (Report No. 1024-30.) Elmer H. Scheibe. OEMsr-1024; Project Nos. RP-109a, AC-295.10 and others. Jansky and Bailey. September, 1945.
- M9** Vulnerability study of Japanese Model B radio set. (Report No. 1024-32.) Paul F. Hoffmann. OEMsr-1024; Project Nos. RP-109a, AC-295.10 and others. Jansky and Bailey. September, 1945.
- 211.3 Jamming Signals**
- M1** Spark jammer experiments at Deal. (Report No. 940-6.) L. E. Hunt. OEMsr-940; Research Project No. RP-199. Bell Telephone Laboratories, Inc. September 29, 1943.
- 211.31 Frequency Modulation**
- M1** Notes on the effectiveness of frequency modulation jamming signals. (Preliminary Report No. 778-3.) M. E. Campbell. [OEMsr-778;] Research Project No. C-63. January 28, 1943.
- M2** Jamming. Notes relative to a type of jamming signal. (Preliminary Report No. 778-6.) A. D. Fowler. [OEMsr-778;] Research Project No. C-63. January 29, 1943.
- M3** The response of a detector to jittered slow frequency modulation. (Technical Memorandum No. 411-29.) John H. Van Vleck. OEMsr-411; Research Project No. RP-182. Harvard University, Radio Research Laboratory. November 19, 1943.
- M4** Mechanical frequency modulation jammers. Effect of jittering. (Report No. 966-35.) W. A. Getchell, G. J. Heinzelman and J. L. Lindner. OEMsr-966; Research Project No. RP-109. Bell Telephone Laboratories, Inc. September 1, 1944.
- 211.32 Efficacy of Signals**
- 211.321 Radio Telegraph**
- M1** Tests of effect of interference on radio telegraph reception. (Report No. 626-1.) D. K. Gannett. OEMsr-626. Western Electric Company, Inc. May 27, 1942.
- M2** Effect of resistance noise on intelligibility of telegraph signals and speech. (Report No. 626-2.) D. K. Gannett. OEMsr-626. Western Electric Company, Inc. June 2, 1942.
- M3** Jamming signals for telegraph communication. (Report No. 966-18.) H. H. Benning. OEMsr-966. Bell Telephone Laboratories, Inc. September 22, 1943.
- M4** Investigation of multicarrier homodyne signal for continuous-wave telegraph jamming. (Report No. 966-26.) C. R. Englund. OEMsr-966; Research Project No. RP-109. Bell Telephone Laboratories, Inc. May 22, 1944.
- M5** Jamming of telegraphy. Keyed noise jamming signals. (Report No. 936-3.) E. Labin, D. D. Grieg and R. B. Reade. OEMsr-936; Project Nos. RP-159 and NLS-613. Federal Telephone and Radio Corporation. July 25, 1944.
- M6** Simple noise generators for static-burst jamming. (Report No. 966-44.) R. L. Robbins. OEMsr-966; Research Project No. RP-148. Bell Telephone Laboratories, Inc. December 21, 1944.
- M7** The jamming effectiveness of a modified step tone jammer. (Report No. 1024-17.) Frank T. Mitchell, Jr. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. January, 1945.
- 211.322 Radio Telephone**
- M1** The effectiveness of various audio frequency noises in masking speech. D. K. Gannett. Research Project No. C-56. Bell Telephone Laboratories, Inc. August 25, 1942.
- M2** Study of interference generation. Final report on NDRC Project C-56. D. K. Gannett. Research Project No. C-56. Bell Telephone Laboratories, Inc. September 22, 1942.
- 211.323 Pulse Modulation**
- M1** Vulnerability of various pulse communication methods to resistance noise. (Preliminary Report No. 778-7.) W. H. Wise and K. C. Black. [OEMsr-778;] Research Project No. C-63. January 30, 1943.
- M2** Jamming and antijamming investigation of a pulse phase modulation communication system. (Report No. 895-14.) John B. Atwood and Grant E. Hansell. OEMsr-895; Research Project No. RP-123. Radio Corporation of America. February 16, 1944.
- M3** Phase modulated vs frequency modulated pulse jamming of a pulse phase modulation communication system. (Report No. 895-26.) John B. Atwood and Grant E. Hansell. OEMsr-895; Research Project No. RP-123. Radio Corporation of America. August 7, 1944.
- M4** Pulse communications jamming and antijamming of pulse phase modulated and pulse frequency modulated systems. (Final Report No. 895-36.) John B. Atwood and Grant E. Hansell. OEMsr-895; Research Project No. RP-123. Radio Corporation of America. January 23, 1945.
- 212 Antijamming**
- 212.1 Antijamming Systems**
- 212.11 Telephone**
- M1** Elimination of enemy radar interference from SCR-522-A receiver BC-624-A. (Report No. 1045-1.) J. M. Hollywood. [OEMsr-1045;] Harvard Uni-

versity, American-British Laboratory. November 16, 1943.

- M2** Study of method of decreasing susceptibility of frequency modulation receivers to continuous-wave jamming. (Report No. 1024-3.) Delmer C. Ports. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. March, 1944.
- M3** Antijamming characteristics of Beechnut. (Report No. 895-20.) Eugene R. Shenk, James A. Spencer and Elmer B. Anderson. OEMsr-895; Research Project No. RP-229. Radio Corporation of America. April 15, 1944.
- M4** Instructions for use of narrow-band frequency modulation adapter for receiver BC-603-D. (Report No. 895-19.) Warren H. Bliss. OEMsr-895; Research Project No. RP-131. Radio Corporation of America. April 26, 1944.
- M5** Modification of BC-639-A receiver to reduce pulse interference. (Report No. 1045-8.) G. P. McCouch. OEMsr-1045. Harvard University, American-British Laboratory. May 17, 1944.
- M6** Pulse tests on receiver BC-624-A. (Preliminary Report No. 1024-6.) Oscar W. B. Reed, Jr. and Elmer H. Scheibe. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. June, 1944.
- M7** The advantage of clipping peak audio voltages prior to modulating when subjected to certain types of interference. (Report No. 1024-15.) Delmer C. Ports. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. December, 1944.
- M8** The antijamming characteristics of frequency modulated receivers. (Report No. 1024-24.) Delmer C. Ports. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. March, 1945.
- M9** [The] Voflag impulse signaling system. (Report No. 895-39.) J. Ernest Smith, James A. Spencer and others. OEMsr-895; Project Nos. RP-229 and SC-93.03. Radio Corporation of America. October 24, 1945.

212.12 Telegraph

- M1** Radio communication system protected against interference. ([Report No.] 937-1.) (n.a.) [OEMsr-937.] Federal Telephone and Radio Corporation. February 19, 1943.
- M2** Antijamming effectiveness of vacuum tube limiter. (Report No. 966-24.) H. H. Benning. OEMsr-966; Research Project No. RP-109. Bell Telephone Laboratories, Inc. December 28, 1943.
- M3** Antijamming characteristics of printing telegraph systems. (Report No. 895-13.) James A. Spencer. OEMsr-895; Research Project No. RP-227. Radio Corporation of America. January 15, 1944.
- M4** Protected communication system. (Report No. 937-2.) E. M. Delvaine(?) OEMsr-937; Research Project No. RP-124. Federal Telephone and Radio Corporation. April 28, 1944.
- M5** Radio communication system protected against interference. (Final Report No. 937-3.) H. Busignies, S. H. Dodington and others. OEMsr-937; Project

Nos. RP-124 and AC-293.04. Federal Telephone and Radio Corporation. July 12, 1945.

212.13 Miscellaneous Antijamming Problems

- M1** Antijamming facsimile transmission system. (Report No. 895-12.) C. N. Gillespie. OEMsr-895; Research Project No. RP-228. Radio Corporation of America. January 12, 1944.
- M2** The importance of removing pulse width variations in a pulse frequency modulation communication system. (Report No. 895-30.) John B. Atwood and Grant E. Hansell. OEMsr-895; Research Project No. RP-123. Radio Corporation of America. October 25, 1944.

220 Radar Systems

221 Jamming of Radar

221.1 Theory

- M1** A study of jamming of radar systems. (Report No. 2.) John F. Byrne and Roger J. Pierce. Research Project No. B-500. Harvard University, Radio Research Laboratory. July 6, 1942.
- M2** [The] B-500 synthetic radar and jamming equipment for laboratory studies of jamming. (Report No. 31.) Roger J. Pierce. Research Project No. B-500. Harvard University, Radio Research Laboratory. April 10, 1943.
- M3** Note on the equivalent forms for the mean output of an unbiased linear rectifier subject to noise. (Technical Memorandum No. 411-41.) David Middleton. OEMsr-411; Research Project No. RP-181. Harvard University, Radio Research Laboratory. January 15, 1944.

221.11 Radar Echoes

- M1** Preliminary considerations concerning radar echoes and radio countermeasures parameters in naval operations. (Technical Memorandum No. 411-106.) T. S. Kuhn. OEMsr-411; Research Project No. RP-299. Harvard University, Radio Research Laboratory. May 31, 1944.
- M2** Theory of ship echoes as applied to naval radio countermeasures operations. (Report No. 411-93.) T. S. Kuhn and Peter J. Sutro. OEMsr-411; Research Project No. RP-186. Harvard University, Radio Research Laboratory. July 14, 1944.
- M3** The Radio Research Laboratory E-2106 aural doppler attachment for the Mark 4 radar. (Report No. 411-170.) H. O. Anger. OEMsr-411; Research Project No. RP-406. Harvard University, Radio Research Laboratory. April 9, 1945.

221.12 Signals and Noise

- M1** Side-band energy in a modulated wave. (Report No. 7.) Warren D. White. Harvard University, Radio Research Laboratory. November 27, 1942.
- M2** Spectra due to simultaneous amplitude and frequency modulation. (Technical Memorandum No.

411-26.) T. S. Kuhn and L. Hoffman. OEMsr-411; Research Project No. RP-217. Harvard University, Radio Research Laboratory. November 24, 1943.

M3 The theoretical effect of integration on the visibility of weak signals through noise. (Report No. 411-77.) Peter J. Sutro. OEMsr-411; Research Project No. RP-318. Harvard University, Radio Research Laboratory. February 4, 1944.

M4 Reactance switching. A method of producing wide-band frequency modulation. (Technical Memorandum No. 411-90.) J. W. Kearney. OEMsr-411; Research Project No. RP-203. Harvard University, Radio Research Laboratory. March 28, 1944.

M5 Theory of the visual vs aural or meter reception of radar signals in the presence of noise. (Report No. 411-86.) John H. Van Vleck and David Middleton. OEMsr-411; Research Project No. RP-181. Harvard University, Radio Research Laboratory. May 5, 1944.

M6 Note on the theory of square-law rectification of a modulated carrier in the presence of noise. (Report No. 411-86A.) David Middleton. OEMsr-411; Research Project No. RP-181. Harvard University, Radio Research Laboratory. July 12, 1944.

M7 [The] Flying Dutchman. [A] modification of search radar to provide target-complexity indication. (Report No. 411-188.) E. R. Brill and Ralph H. Hoglund. OEMsr-411; Project Nos. RP-406J and NA-180. Harvard University, Radio Research Laboratory. May 21, 1945.

221.13 Miscellaneous Research

M1 Notes on power required for noise jamming. (Report No. 44.) F. E. Terman and Warren D. White. Harvard University, Radio Research Laboratory. June 18, 1943.

M2 Radio countermeasures against radar blind bombing equipment. (Report No. 411-228.) W. Hamermesh and Robert Weinstock. OEMsr-411; Project Nos. RP-474 and SC-98.10. Harvard University, Radio Research Laboratory. September 5, 1945.

M3 Experimental determination of formation factor. (Report No. 411-278.) J. F. Youngblood and B. M. Kuck. OEMsr-411; Research Project No. RP-299. Harvard University, Radio Research Laboratory. October 22, 1945.

M4 Techniques of still and motion picture photography of radar screens. (Report No. 411-276.) C. Gray and S. W. Athey. OEMsr-411. Harvard University, Radio Research Laboratory. February 5, 1946.

221.2 Susceptibility of Radar Systems to Jamming

M1 Jamming studies of 10-cm radar systems. (Report No. 41.) Ellis W. Shuler, Jr., J. J. Livingood and J. H. Woodruff, II. Research Project No. A-1200. Harvard University, Radio Research Laboratory. July 9, 1943.

221.21 Airborne

M1 The susceptibility to jamming of the Navy ASVC, or the Army SCR-521-A radar. (Preliminary Report No. 36.) Oswald G. Villard, Jr. and S. F. Kaisel. Research Project No. E-300. Harvard University, Radio Research Laboratory. May 31, 1943.

M2 The susceptibility to jamming of the Navy ASG/Army SCR-617. (Report No. 42.) J. H. Woodruff, II. Research Project No. L-400. Harvard University, Radio Research Laboratory. June 22, 1943.

M3 The susceptibility to jamming of the SCR-717-B. (Preliminary Report No. 411-72.) J. H. Woodruff, II. OEMsr-411; Research Project No. RP-277. Harvard University, Radio Research Laboratory. December 15, 1943.

M4 The susceptibility of the SCR-720-A to jamming. (Report No. 411-183.) J. H. Woodruff, II. OEMsr-411; Project Nos. RP-367 and SCR-720A. Harvard University, Radio Research Laboratory. April 26, 1945.

M5 Antijamming study of AN/APQ-5B laboratory attachment. (Report No. 411-205.) F. P. Cowan, K. A. Davis and J. H. Woodruff, II. OEMsr-411; Project Nos. RP-452 and AC-292.03. Harvard University, Radio Research Laboratory. June 15, 1945.

M6 The susceptibility to jamming of the AN/APG-1 radar. (Report No. 411-214.) J. H. Woodruff, II and F. P. Cowan. OEMsr-411; Projects Nos. RP-368 and AC-292.03. Harvard University, Radio Research Laboratory. July 5, 1945.

M7 Jamming susceptibility of the AN/APS-4, ASH, radar and the APA-16 bombing attachment. (Report No. 411-215.) Ralph H. Hoglund. OEMsr-411; Project Nos. RP-411, NA-219 and others. Harvard University, Radio Research Laboratory. July 14, 1945.

M8 Jamming tests on AN/APG-4 aircraft radar equipment. (Report No. 1305-22.) Judson Mead and Edmond W. Westrick. OEMsr-1305; Research Project No. RP-334. Airborne Instruments Laboratory, Inc. August 31, 1945.

M9 Proposed field tests of AN/APS-4 radar. (Report No. 411-245.) Ralph H. Hoglund and F. P. Cowan. OEMsr-411; Project Nos. RP-411 and NA-219. Harvard University, Radio Research Laboratory. September 12, 1945.

221.22 Shipboard

M1 The susceptibility to jamming of the Navy Mark IV (FD) radar. (Preliminary Report No. RRL-53.) D. R. Scheuch and S. F. Kaisel. Research Project No. E-500. Harvard University, Radio Research Laboratory. September 9, 1943.

M2 Summary of antijamming developments for ASB radar systems. (Report No. 411-178.) R. E. Kell. OEMsr-411; Project Nos. RP-223 and NA-159. Harvard University, Radio Research Laboratory. April 15, 1945.

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221.23 Ground

- M1** The susceptibility to jamming of the SCR-268. (Preliminary Report No. 24.) Oswald G. Villard, Jr. Research Project No. E-200. Harvard University, Radio Research Laboratory. February 27, 1943.
- M2** Antijamming wiring changes in SCR-268. (Report No. 411-118.) Richard S. O'Brien and W. Y. Pan. OEMsr-411; Research Project No. RP-171. Harvard University, Radio Research Laboratory. October 26, 1944.
- M3** Summary of antijamming developments for the SCR-268 radar system. (Report No. 411-179.) W. Y. Pan and Richard S. O'Brien. OEMsr-411; Project Nos. RP-171 and SC-92.07. Harvard University, Radio Research Laboratory. May 2, 1945.
- M4** Antijamming evaluation of AN/TPL-1. (Report No. 411-219.) H. O. Anger. OEMsr-411; Project Nos. RP-453 and SC-92.11. Harvard University, Radio Research Laboratory. August 1, 1945.
- M5** The susceptibility to jamming of the SCR-545. (Report No. 411-231.) J. H. Woodruff, II, H. O. Anger and K. A. Davis. OEMsr-411; Project Nos. RP-475 and SC-92.12. Harvard University, Radio Research Laboratory. September 5, 1945.

221.3 Laboratory Studies of Jamming**221.31 Laboratory Testing**

- M1** Measurements of jamming effectiveness. (Report No. 411-250.) R. L. Henkel, T. S. Kuhn and others. OEMsr-411; Project Nos. AC-294.12 and RP-338. Harvard University, Radio Research Laboratory. September 21, 1945.
- M2** Laboratory studies of jamming effectiveness. (Report No. 411-248.) Donald W. Taylor. OEMsr-411; Project Nos. AC-296.01, RP-103 and others. Harvard University, Radio Research Laboratory. October 17, 1945.

221.32 Type A Presentation

- M1** Jamming of the Type A presentation with sine wave amplitude modulation, noise amplitude modulation, and with Dina. (Report No. 55.) Donald W. Taylor and D. A. Peterson. Research Project No. K-400. Harvard University, Radio Research Laboratory. September 23, 1943.
- M2** Jamming of the Type A presentation with sine wave frequency modulation, noise frequency modulation, and with various combinations of frequency modulation and amplitude modulation. (Report No. 411-65.) Donald W. Taylor and D. A. Peterson. OEMsr-411; Research Project No. RP-186. Harvard University, Radio Research Laboratory. November 26, 1943.
- M3** The effectiveness of amplitude modulation, frequency modulation, and Dina jamming of the Type A presentation as a function of i-f and of video overloading. (Report No. 411-71.) Donald W. Taylor. OEMsr-411; Research Project No.

RP-186. Harvard University, Radio Research Laboratory. January 12, 1944.

- M4** Jamming of the Type A presentation with periodic pulses and with random pulses. (Report No. 411-75.) Donald W. Taylor and James M. Moran. OEMsr-411; Research Project No. RP-186. Harvard University, Radio Research Laboratory. January 25, 1944.

221.33 Type B Presentation (Projection)

- M1** Jamming of the Type B presentation. (Report No. 411-80.) Donald W. Taylor and James M. Moran. OEMsr-411; Research Project No. RP-186. Harvard University, Radio Research Laboratory. February 21, 1944.
- M2** The effectiveness of jamming of the Type B presentation as a function of i-f and of video overloading. (Report No. 411-85.) Donald W. Taylor. OEMsr-411; Research Project No. RP-186. Harvard University, Radio Research Laboratory. March 27, 1944.

221.4 Field Tests of Jamming

- M1** Synthetic giant Wurzburg. (Report No. 411-81.) F. P. Cowan. OEMsr-411; Research Project No. RP-179. Harvard University, Radio Research Laboratory. March 15, 1944.
- M2** Synthetic giant Wurzburg. Antenna modification. (Report No. 411-81A.) J. F. Youngblood. OEMsr-411; Research Project No. RP-179. Harvard University, Radio Research Laboratory. June 22, 1944.
- M3** Modification of SCR-648 to simulate German Wurzburgs. (Report No. 411-110.) D. R. Scheuch. OEMsr-411; Research Project No. RP-343. Harvard University, Radio Research Laboratory. October 11, 1944.
- M4** Modification of ASC-1 for dual polarization operation. (Report No. 411-141.) D. R. Scheuch. OEMsr-411; Research Project No. RP-406. Harvard University, Radio Research Laboratory. December 21, 1944.
- M5** Airborne jamming tests against aircraft interception radars. (Report No. 411-226.) John J. Wittkopf. OEMsr-411; Project Nos. NA-224 and RP-459. Harvard University, Radio Research Laboratory. August 11, 1945.
- M6** The P-102 pulse amplitude recorder and time marker. (Report No. 411-257.) Raymond K. Vermillion. OEMsr-411; Research Project No. RP-299. Harvard University, Radio Research Laboratory. September 28, 1945.

222**Antijamming of Radar**

- M1** Fundamentals of radar antijamming. Report of Antijamming Practices Panel. (Handbook No. HB-1.) (n.a.) MIT Radiation Laboratory, Naval Research Laboratory and other institutions. (n.d.)

222.1 Electronic Antijamming

- M1** Antijamming doctoring of FD radar. (Technical Memorandum No. 411-51.) Richard S. O'Brien. OEMsr-411; Research Project No. RP-214. Harvard University, Radio Research Laboratory. February 2, 1943.
- M2** Suggested antijamming video amplifiers for SCR-717-B. (Technical Memorandum No. 411-33.) J. H. Woodruff, II. OEMsr-411. Harvard University, Radio Research Laboratory. January 19, 1944.
- M3** The improvement in minimum detectable signal in noise through the use of the long afterglow cathode-ray tube and through photographic integration, with a discussion of the resulting increase in maximum range of early warning radar systems. (Report No. 411-84.) E. R. Brill. OEMsr-411; Research Project No. RP-318. Harvard University, Radio Research Laboratory. February 8, 1944.
- M4** Plug-in antijamming high-pass filter. (Technical Memorandum No. 411-56.) H. O. Anger. OEMsr-411; Research Project No. RP-224. Harvard University, Radio Research Laboratory. February 18, 1944.
- M5** Preliminary operating instructions for E-1610 plug-in antijamming high-pass filter. (Instruction Book No. 411-IB-24.) (n.a.) Harvard University, Radio Research Laboratory. March 16, 1944.
- M6** Antijamming practice for fire control radar systems. (Technical Memorandum No. 411-87.) H. O. Anger. OEMsr-411; Research Project No. RP-224. Harvard University, Radio Research Laboratory. March 23, 1944.
- M7** [The] E-512 detuning device for Navy Mark 3 and Mark 4 and Army SCR-296-A radars. (Technical Memorandum No. 411-117.) H. O. Anger and Richard S. O'Brien. OEMsr-411; Research Project No. RP-224. Harvard University, Radio Research Laboratory. May 19, 1944.
- M8** Results of the field jamming tests and laboratory tests of the replacement video amplifier for the SCR-717-B. (Report No. 411-46.) J. H. Woodruff, II. OEMsr-411; Research Project No. RP-277. Harvard University, Radio Research Laboratory. August 15, 1944.
- M9** The use of lobe switching in transmission only, as an antijamming measure. (Report No. 411-112.) E. R. Brill and F. P. Cowan. OEMsr-411; Research Project No. RP-318. Harvard University, Radio Research Laboratory. October 20, 1944.
- M10** Supplemental instruction book for installing the Navy Type CAOS-50 AEY i-f to video converter on the SCR-296 radar. (Instruction Book No. 411-IB-56.) H. O. Anger. OEMsr-411; Research Project No. RP-224. Harvard University, Radio Research Laboratory. October 26, 1944.
- M11** Preliminary operating instructions for E-410/12 plug-in antijamming high-pass filter and receiver antijamming modification. (Instruction Book No. 411-IB-14.) R. E. Kell. OEMsr-411; Research

Project No. RP-223. Harvard University, Radio Research Laboratory. January 18, 1945.

- M12** [Some] i-f circuit modifications of SCR-268. (Report No. 411-164.) W. Y. Pan. OEMsr-411; Research Project No. RP-171. Harvard University, Radio Research Laboratory. March 23, 1945.

- M13** An antijamming measure for use against circularly polarized jamming. (Report No. 411-207.) J. H. Woodruff, II, A. Keck and Richard S. O'Brien. OEMsr-411; Project Nos. AC-292.01, NA-218 and RP-214. Harvard University, Radio Research Laboratory. June 20, 1945.

222.2 Confusion Antijamming

- M1** Identification of naval spoofs. (Report No. 411-129.) Lewis R. Koller. OEMsr-411; Research Project No. RP-258. Harvard University, Radio Research Laboratory. November 29, 1944.

- M2** Analysis for a possible antijamming system against Window. (Report No. 411-128.) David Middleton and Peter J. Sutro. OEMsr-411; Research Project No. RP-182. Harvard University, Radio Research Laboratory. December 9, 1944.

230 Electronic Jamming

- M1** The calculation of the effectiveness of electronic jamming of radar controlled flak and searchlights. (Report No. 411-251.) David A. Park and R. D. Sard. OEMsr-411; Project Nos. RP-299, AC-294.22 and SC-94.22. Harvard University, Radio Research Laboratory. November 16, 1945.

231 Barrage Jamming

- M1** Notes on the efficacy of a series of pulses for barrage jamming. (Report No. 32.) John H. Van Vleck. Research Project No. G-200. Harvard University, Radio Research Laboratory. April 16, 1943.

- M2** The spectra of noise modulated waves and their relative efficiencies for barrage jamming. (Report No. 29.) David Middleton. Research Project No. G-100. Harvard University, Radio Research Laboratory. April 23, 1943.

- M3** Four types of frequency modulation and their possible use for radar and communication jamming. (Report No. 56.) David Middleton and M. Steinberg. Research Project No. G-300. Harvard University, Radio Research Laboratory. September 23, 1943.

- M4** Radio frequency requirements of barrage jamming. (Report No. 940-8.) W. J. Albersheim. OEMsr-940; Research Project No. RP-235. Bell Telephone Laboratories, Inc. October 20, 1943.

- M5** Study of airborne barrage jamming systems at frequencies of 27 to 42 megacycles. (Report No. 966-36.) W. J. Albersheim, V. A. Douglas and others. OEMsr-966; Research Project No. RP-150. Bell Telephone Laboratories, Inc. November 10, 1944.

- M6** Barrage communications jamming studies and de-

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velopment. (Final Report No. 940-21.) M. J. Kelly. OEMsr-940; Research Project Nos. RP-132, RP-150 and others. Bell Telephone Laboratories, Inc. February 20, 1945.

232 Spot Frequency Jamming

- M1** Monitoring and tracking. (Report No. 895-8.) W. A. Anderson. OEMsr-895; Research Project No. RP-263. Radio Corporation of America. October 26, 1943.
- M2** Airborne spot jamming system study. (Report No. 966-27.) W. C. Babcock, R. L. Robbins and others. OEMsr-966; Research Project No. RP-358. Bell Telephone Laboratories, Inc. April 27, 1944.
- M3** Preliminary design of airborne multiple spot jamming system. (Report No. 993-2.) E. R. Taylor. OEMsr-993; Research Project No. RP-122. Bell Telephone Laboratories, Inc. August 23, 1944.
- M4** Spot frequency jamming techniques. (Report No. 411-122.) F. P. Cowan. OEMsr-411. Harvard University, Radio Research Laboratory. November 6, 1944.
- M5** An antijamming measure for setting-on receivers. (Report No. 411-167.) J. H. Woodruff, II. OEMsr-411; Research Project No. RP-447. Harvard University, Radio Research Laboratory. March 26, 1945.
- M6** Listening-through and jammer alignment systems. (Final Report No. 993-3.) E. R. Taylor. OEMsr-993; Project Nos. RP-122, SC-95.11 and NS-128. Bell Telephone Laboratories, Inc. June 8, 1945.

240 Confusion Reflectors

241 Window

- M1** Analysis of Window and related matters. (Report No. 4.) L. J. Chu. Research Project No. A-400. Harvard University, Radio Research Laboratory. October 22, 1942.
- M2** Recent research on Window. (Report No. 50.) F. L. Whipple and W. W. Farley. Research Project No. G-500. Harvard University, Radio Research Laboratory. July 1, 1943.
- M3** Window tests at Florosa Field and Camp Davis. (Special Report No. 931-1.) H. C. Pollock and F. L. Whipple. OEMsr-931. General Electric Company. July 6, 1943.
- M4** The usefulness of long-persistence screens as a countermeasure against Window. (Technical Memorandum No. 411-32.) E. R. Brill. OEMsr-411; Research Project No. RP-318. Harvard University, Radio Research Laboratory. November 26, 1943.
- M5** Review of Window. (Report No. 411-91.) Gerard P. Kuiper. OEMsr-411; Research Project No. RP-103. Harvard University, Radio Research Laboratory. May 30, 1944.
- M6** A condensed summary of the present status of Window development at Radio Research Laboratory. (Report No. 411-106.) F. L. Whipple.

OEMsr-411; Research Project No. RP-103. Harvard University, Radio Research Laboratory. October 2, 1944.

- M7** Window developments. (Report No. 411-236.) Felix Bloch, A. T. Goble and others. OEMsr-411; Project Nos. RP-103, AC-69 and others. Harvard University, Radio Research Laboratory. December 4, 1945.
- M8** Experimental Window research. (Report No. 867-9.) Robert Serrell, Edgar C. Hayden and Bernard Erde. OEMsr-867; Project Nos. RP-406-G and SC-96.01. Columbia Broadcasting System, Inc. February, 1946.

241.1 Chaff

- M1** A study of Chaff echoes at 515 mc. (Report No. 411-73.) Gerard P. Kuiper. OEMsr-411; Research Project No. RP-257. Harvard University, Radio Research Laboratory. December 19, 1943.
- M2** Results of Chaff tests at Florosa [Field, Florida], December 13 to 20, 1943 and January 18, 1944. (Technical Memorandum No. 411-108.) Edited by: J. Levine. OEMsr-411; Research Project No. RP-103. Harvard University, Radio Research Laboratory. April 5, 1944.
- M3** Return cross sections from random oriented resonant half-wave length Chaff. (Technical Memorandum No. 411-127.) Felix Bloch, Morton Hamermesh and M. Phillips. OEMsr-411; Research Project No. RP-257. Harvard University, Radio Research Laboratory. June 19, 1944.
- M4** The dependence of the response of microwave Chaff on polarization and angle of elevation. (Technical Memorandum No. 411-126.) R. D. Sard and L. Hoffman. OEMsr-411; Research Project No. RP-257. Harvard University, Radio Research Laboratory. June 22, 1944.
- M5** Theory of the radar response of Chaff. (Report No. 411-103.) John H. Van Vleck, Felix Bloch and Morton Hamermesh. OEMsr-411; Research Project No. RP-406. Harvard University, Radio Research Laboratory. October 13, 1944.
- M6** Estimate of square sheet echo cross-section. Theoretical evaluation of broadside echoes from circular cylinder for perpendicular polarization. (Report No. 411-125.) Robert Weinstock. OEMsr-411; Research Project No. RP-406. Harvard University, Radio Research Laboratory. November 14, 1944.
- M7** Probability calculations on Chaff clouds, protecting against MC-382 fuzes. (Report No. 411-174.) Felix Bloch. OEMsr-411; Research Project No. RP-406. Harvard University, Radio Research Laboratory. April 20, 1945.

241.2 Rope

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- M2** Concerning the use of metallized Ropes as confusion reflectors. (Technical Memorandum No. 411-28.) Eugene Fubini and Morton Hamermesh. OEMsr-411; Research Project No. RP-257. Harvard University, Radio Research Laboratory. October 27, 1943.
- M3** Reflection of long Ropes. (Technical Memorandum Nos. 411-100 and -100A.) Felix Bloch, Morton Hamermesh and M. Phillips. OEMsr-411; Research Project No. RP-257. Harvard University, Radio Research Laboratory. April 14 and June 1, 1944.
- M4** Equivalent radius of thin cylindrical antennas. (Technical Memorandum No. 411-125.) Felix Bloch and Morton Hamermesh. OEMsr-411; Research Project No. RP-257. Harvard University, Radio Research Laboratory. June 20, 1944.
- M5** Balloon-supported Ropes. (Technical Memorandum No. 411-133.) H. C. Pollock. OEMsr-411; Research Project No. RP-257. Harvard University, Radio Research Laboratory. June 26, 1944.
- M6** Field tests of Ropes. (Technical Memorandum No. 411-136.) Arthur W. Tyler. OEMsr-411; Research Project No. RP-406. Harvard University, Radio Research Laboratory. August 1, 1944.
- M7** The reflection of electromagnetic waves by long wires and non-resonant cylindrical conductors. (Report No. CRB-45/49.) J. M. C. Scott and T. Pearcey. OSRD Liaison Office No. WR-1459. Radar Research and Development Establishment, Great Britain, November 16, 1944.

241.3 Angels

- M1** Project Angels. An investigation of folding corner reflectors. (Report No. 931-4.) W. K. Kearsley. OEMsr-931; Research Project No. RP-258. General Electric Company. September 7, 1943.
- M2** Radar echoes from Angels obtained at Florosa Field, Florida. (Technical Memorandum No. 411-91.) H. C. Pollock and J. Levine. OEMsr-411; Research Project No. RP-258. Harvard University, Radio Research Laboratory. March 27, 1944.
- M3** Echo characteristics of three reflectors at 565 mc. (Technical Memorandum No. 411-109.) H. C. Pollock. OEMsr-411; Research Project No. RP-258. Harvard University, Radio Research Laboratory. April 1, 1944.
- M4** Echoes from Angels at 565 mc obtained at Florosa Field, Florida. (Technical Memorandum No. 411-131.) J. Levine. OEMsr-411; Research Project No. RP-258. Harvard University, Radio Research Laboratory. July 7, 1944.
- M5** Misdirection of lobed radar by mechanical means. (Report No. 411-224.) Robert Weinstock. OEMsr-411; Project Nos. RP-406e and AC-296.01. Harvard University, Radio Research Laboratory. August 7, 1945.

- M6** Corner reflectors, Angels. (Report No. 931-27.) W. K. Kearsley. OEMsr-931; Project Nos. RP-258, SC-96.02 and NA-180. General Electric Company. September 26, 1945.

241.31 Reflection Patterns

- M1** Angel at 515 mc. Reflection patterns. (Report No. 759-16.) George Sinclair and Robert B. Jacques. OEMsr-759; Research Project No. RP-269. Ohio State University. February 14, 1944.
- M2** Angel at 360 mc. Reflection patterns. (Report No. 759-17.) Robert B. Jacques. OEMsr-759; Research Project No. RP-269. Ohio State University. February 18, 1944.
- M3** Angel at 1000 mc. Reflection patterns. (Report No. 759-19.) Robert B. Jacques. OEMsr-759; Research Project No. RP-269. Ohio State University. February 18, 1944.
- M4** Angel at 410 mc. Reflection patterns. (Report No. 759-18.) Robert B. Jacques. OEMsr-759; Research Project No. RP-269. Ohio State University. February 20, 1944.
- M5** Reflection measurements on wire grids and mesh Angels at 2000 and 3000 mc. (Report No. 759-25.) George Sinclair and Robert B. Jacques. OEMsr-759; Research Project No. RP-269. Ohio State University, August 16, 1944.

241.4 Window Problems

- M1** Propeller modulation detection. (Technical Memorandum No. 411-25.) D. R. Scheuch. OEMsr-411; Research Project No. RP-213. Harvard University, Radio Research Laboratory. November 3, 1943.

242 Underwater Confusion Devices

- M1** Theory of reduction of submarine echoes by shielding screens. (Report No. 411-99.) Robert Weinstock. OEMsr-411; Research Project No. RP-406. Harvard University, Radio Research Laboratory. October 3, 1944.

243 Equipment Relative to Confusion Reflectors

- M1** Wide-band ultra high frequency amplifier, D-1410. (Report No. 411-102.) John P. Woods and R. O. Petrich. OEMsr-411; Research Project No. RP-210. Harvard University, Radio Research Laboratory. September 22, 1944.
- M2** Flight tests of G-1151 dispenser. (Report No. 411-199.) D. A. Peterson. OEMsr-411; Project Nos. RP-406 and AC-71. Harvard University, Radio Research Laboratory. June 5, 1945.

250 Navigational Systems Jamming

- M1** The vulnerability of loran to radio countermeasures. (Report No. 20.) A. Earl Cullum, Jr. and D. A. Peterson. Research Project No. K-100. Harvard University, Radio Research Laboratory. February 15, 1943.

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- M2** The blanket system. (Report No. 895-40.) H. O. Peterson, Warren H. Bliss and others. OEMsr-895; Research Project No. RP-252. [Radio Corporation of America.] October 3, 1945.
- M3** Countermeasures and anticountermeasures for radio navigation aids. Survey of basic technical considerations. (Report No. 966-55.) K. L. Maurer. OEMsr-966; Project Nos. RP-422 and SC-95.16. Bell Telephone Laboratories, Inc. October 15, 1945.
- 260 Jamming of Specific Devices**
- 261 Altimeters**
- M1** Jamming the German FG-101, FG-101A [and] FG-103 radio altimeters. (Technical Memorandum No. 411-99.) Donald Foster. OEMsr-411; Research Project No. RP-299. Harvard University, Radio Research Laboratory. March 22, 1944.
- M2** Jamming tests of frequency modulated radio altimeters. (Report No. 1305-12.) Judson Mead. OEMsr-1305; Project Nos. RP-334 and NS-393.05. Airborne Instruments Laboratory, Inc. April 30, 1945.
- 262 Proximity Fuzes**
- M1** Repeater jamming of proximity fuzes. (Report No. 1305-26.) Russell R. Yost, Jr. and Walter E. Tolles. OEMsr-1305; Project Nos. RP-117, SC-98.07 and NA-109. Airborne Instruments Laboratory, Inc. January 27, 1946.
- M2** Countermeasures against radio proximity fuzes for rotated projectiles. (Report No. 1305-27.) Russell R. Yost, Jr. and Walter E. Tolles. OEMsr-1305; Project Nos. RP-117, SC-98.07 and NA-109. Airborne Instruments Laboratory, Inc. March 20, 1946.
- 263 Guided Missiles**
(See also: 830)
- M1** AN/ARQ-8 equipment as a countermeasure for German guided missiles. (Technical Memorandum No. 411-68.) Compiled by: Oswald G. Villard, Jr. and Barbara Bacorn. OEMsr-411; Research Project Nos. RP-250 and RP-267. Harvard University, Radio Research Laboratory. May 16, 1944.
- M2** Antijamming study of Navy RHB radio set. (Report No. 411-131.) F. P. Cowan, Ralph H. Hoglund and D. R. Scheuch. OEMsr-411; Research Project No. RP-355. Harvard University, Radio Research Laboratory. November 17, 1944.
- M3** Shipboard jamming equipment, Type MAS. (Report No. 1305-3.) R. F. Schulz, D. M. Miller and E. W. Adams. OEMsr-1305; Research Project No. RP-395. Airborne Instruments Laboratory, Inc. January 2, 1945.
- M4** Antijamming study of Mark 31 receiver, Bat. (Report No. 411-146.) F. P. Cowan, Ralph H. Hoglund and D. R. Scheuch. OEMsr-411; Research Project No. RP-436. Harvard University, Radio Research Laboratory. January 19, 1945.
- M5** Handbook of instructions for Model MAS radio transmitting and receiving equipment. (Report No. 1305-5.) (n.a.) OEMsr-1305; Research Project No. RP-395. Airborne Instruments Laboratory, Inc. February 12, 1945.
- M6** AN/GRQ-1 jamming equipment. (Report No. 1305-13.) Orrin W. Towner, Jay W. Wright and others. OEMsr-1305; Project Nos. RP-420a and SC-95.12. Airborne Instruments Laboratory, Inc. May 31, 1945.
- M7** AN/SRQ-1 multichannel jamming equipment. (Report No. 1305-17.) Otto H. Schmitt, R. G. Madsen and others. OEMsr-1305; Project Nos. RP-389, NA-109 and NS-395.04. Airborne Instruments Laboratory, Inc. August 31, 1945.
- M8** AN/ARQ-11 and AN/SRQ-11 (XN-1) jamming equipment. (Report No. 1305-18.) J. N. Fricker, Otto H. Schmitt and others. OEMsr-1305; Project Nos. RP-419a, SC-95.14 and others. Airborne Instruments Laboratory, Inc. August 31, 1945.
- 263.1 Magnetic Recorders**
- M1** Handbook of instructions [for the] magnetic tape recorder, Serial 4, 5 and 6. (Report No. 1305-7.) (n.a.) OEMsr-1305; Research Project No. RP-361. Airborne Instruments Laboratory, Inc. April 4, 1945.
- M2** Handbook of instructions [for the] magnetic tape recorder, Serial 1, 2 and 3. (Report No. 1305-9.) (n.a.) OEMsr-1305; Project Nos. RP-361, SC-98.07 and NA-109. Airborne Instruments Laboratory, Inc. May 5, 1945.
- M3** Peter Pan jamming system and magnetic tape recorders. (Report No. 1305-16.) Reuben A. Isberg and E. W. Adams, Jr. OEMsr-1305; Project Nos. RP-361, SC-98.07, NA-109 and NS-391.02. Airborne Instruments Laboratory, Inc. August 31, 1945.
- 300 RADIO COUNTERMEASURE EQUIPMENT**
- 310 Receivers**
- M1** Summary of Radio Research Laboratory receiver projects, December 1, 1943. (Technical Memorandum No. 411-57.) Joseph M. Pettit. OEMsr-411. Harvard University, Radio Research Laboratory. February 2, 1944.
- 311 Search Receivers**
- 311.1 Airborne Search Receivers**
- 311.11 Communications**
- 311.111 ARC-1**
- M1** Performance characteristics of receiver SCR-587/CPR-46AAO (ARC-1). (Report No. 895-7.) Warren

H. Bliss. OEMsr-895; Research Project No. RP-131. Radio Corporation of America. October 22, 1943.

M2 [The] D-1901 modification kit for i-f gain control, and automatic volume control switch for SCR-587 and ARC-1 receivers. (Technical Memorandum No. 411-73.) Joseph M. Pettit. OEMsr-411. Harvard University, Radio Research Laboratory. February 14, 1944.

M3 [The] D-1903 conversion for operation of ARC-1 receiver from a 28-volt power source. (Technical Memorandum No. 411-75.) Joseph M. Pettit. OEMsr-411. Harvard University, Radio Research Laboratory. February 18, 1944.

311.112 ARR-5, -7 and -24

M1 Modifications and performance of R-45/ARR-7 receivers for use in communications Ferrets. (Report No. 966-53.) R. V. Crawford. OEMsr-966; Project Nos. RP-440B and AC-291.01. Bell Telephone Laboratories, Inc. August 22, 1945.

M2 Modifications and performance of R-44/ARR-5 receivers for use in communications Ferrets. (Report No. 966-52.) E. O. Bernard and C. R. Eckberg. OEMsr-966; Project Nos. RP-440B and AC-291.01. Bell Telephone Laboratories, Inc. August 23, 1945.

M3 Airborne Instruments Laboratory search receiver. (Report No. 1305-30.) Otto H. Schmitt. OEMsr-1305; Project Nos. RP-117(d), SC-98.09 and others. Airborne Instruments Laboratory, Inc. October, 1946.

311.113 Ferret System

M1 Description of communication Ferret C-1. (Report No. 966-51.) H. H. Benning and G. J. Heinzelman. OEMsr-966; Project Nos. RP-440 and SC-98.05. Bell Telephone Laboratories, Inc. June 8, 1945.

311.12 Radar

311.121 AN/APR-1

M1 The D-1600 variable range motor drive for AN/APR-1 receiver. (Technical Memorandum No. 411-15.) Joseph M. Pettit. OEMsr-411; Research Project No. RP-141. Harvard University, Radio Research Laboratory. August 5, 1943.

M2 Conversion of AN/APR-1 for reduced bandwidth and sensitivity. (Report No. 411-148.) Matthew T. Lebenbaum. OEMsr-411; Research Project No. RP-144. Harvard University, Radio Research Laboratory. January 10, 1945.

311.122 AN/APR-2

M1 APR-2 receiver modifications. (Report No. 411-132.) Paul A. Pearson. OEMsr-411; Research Project No. RP-139. Harvard University, Radio Research Laboratory. November 30, 1944.

311.123 AN/APR-4

M1 The D-514 i-f amplifier for the AN/APR-4 receiver. (Technical Memorandum No. 411-43.) Joseph M. Pettit. OEMsr-411. Harvard University, Radio Research Laboratory. February 7, 1944.

311.124 AN/APR-5

M1 Notes on the use of APR-5 receiver at frequencies above 3000 megacycles. (Technical Memorandum No. 411-137.) George E. Hulstede. OEMsr-411; Research Project No. RP-135. Harvard University, Radio Research Laboratory. August 15, 1944.

M2 Blanking of the AN/APR-5 search receiver. (Report No. 411-143.) W. H. Huggins and J. J. Wedel. OEMsr-411; Research Project No. RP-286. Harvard University, Radio Research Laboratory. December 30, 1944.

M3 Minimum detectable signal as a function of frequency and other characteristics of AN/APR-5A. (Report No. 411-152.) Thomas E. Moore and Walter G. Wadey. OEMsr-411; Research Project No. RP-107. Harvard University, Radio Research Laboratory. March 5, 1945.

M4 Silent Knight. (Report No. 411-230.) James M. Moran. OEMsr-411; Project Nos. RP-448 and AC-290.16. Harvard University, Radio Research Laboratory. August 20, 1945.

311.125 AN/APR-6

M1 AN/APR-6 installation information as of February 19, 1944. (Technical Memorandum No. 411-71.) Walter G. Wadey. OEMsr-411; Research Project No. RP-286. Harvard University, Radio Research Laboratory. February 19, 1944.

311.126 AN/APR-7

M1 Preliminary operating instructions for the D-2100 receiver, AN/APR-7A. (Instruction Book No. 411-IB-49.) (n.a.) OEMsr-411; Research Project No. RP-408. Harvard University, Radio Research Laboratory. October 17, 1944.

311.127 AN/APQ-3 and AN/APQ-4

M1 The AN/APQ-3 (A-2600) and AN/APQ-4 (A-2700) wide range microwave superheterodyne receivers. (Report No. 40.) R. B. Holt. Research Project Nos. A-2600 and A-2700. Harvard University, Radio Research Laboratory. June 2, 1943.

311.2 Component Parts of Search Receivers

311.21 Tuning Units

M1 Operating instructions for Type D-101 tuning unit. (Report No. 6.) David B. Sinclair. Research Project No. D-100. Harvard University, Radio Research Laboratory. October 15, 1942.

M2 Operating instructions for Type D-104-A tuning unit. (Report No. 16.) David B. Sinclair. Research

Project No. D-100. Harvard University, Radio Research Laboratory. January 20, 1943.

- M3** Operating instructions for Type D-102 tuning unit. (Report No. 17.) David B. Sinclair. Research Project No. D-100. Harvard University, Radio Research Laboratory. January 25, 1943.

- M4** Preliminary description of the D-1500, 1000 to 3300 mc, tuner for search receivers. (Technical Memorandum No. 411-49.) Joseph M. Pettit. OEMsr-411; Research Project No. RP-141. Harvard University, Radio Research Laboratory. February 2, 1944.

- M5** [The] D-1902 motor noise filter for TU-57B and TU-58B tuning units for SCR-587 receiver. (Technical Memorandum No. 411-74.) Joseph M. Pettit. OEMsr-411. Harvard University, Radio Research Laboratory. February 14, 1944.

- M6** Temporary conversion of Sickles tuning units TU-57B and TU-58B to sector sweep. (Technical Memorandum No. 411-84.) Robert R. Buss. OEMsr-411; Research Project No. RP-141. Harvard University, Radio Research Laboratory. February 24, 1944.

- M7** [The] D-1905 spurious response indicator for D-101 and D-102 tuning units. (Technical Memorandum No. 411-141.) F. J. Kamphoefner. OEMsr-411; Research Project No. RP-381. Harvard University, Radio Research Laboratory. September 12, 1944.

- M8** Résumé of ultra high frequency tuned-circuit preselectors. (Report No. 411-259.) Paul I. Richards and Seymour B. Cohn. OEMsr-411; Project Nos. RP-442, AC-290.12 and AC-290.16. Harvard University, Radio Research Laboratory. January 11, 1946.

311.22 Pulse-Stretcher

- M1** The pulse-stretcher as a device for increasing the audio sensitivity of search receivers. (Report No. 411-144.) W. H. Huggins and J. W. Kearney. OEMsr-411; Research Project No. RP-286. Harvard University, Radio Research Laboratory. March 14, 1945.

311.23 Video Analyzer

- M1** Radar video analyzer. (Report No. 411-220.) C. C. Loomis. OEMsr-411; Project Nos. RP-462b and NS-394.10. Harvard University, Radio Research Laboratory. August 1, 1945.

311.3 Automatic or Recording Search Receivers

- M1** The RC-160 receiver, autosearch. (Report No. 13.) E. L. Plotts. Research Project No. C-1100. Harvard University, Radio Research Laboratory. March 1, 1943.

- M2** The R-1800 recording search receiver. (Technical Memorandum No. 411-44.) R. C. Raymond. OEMsr-411; Research Project No. RP-286. Harvard University, Radio Research Laboratory. February 9, 1944.

311.31 Recorders

- M1** Preliminary description and specifications of D-1800 recorder for search receivers. (Technical Memorandum No. 411-50.) H. E. Overacker and Joseph M. Pettit. OEMsr-411; Research Project No. RP-276. Harvard University, Radio Research Laboratory. November 27, 1943.

- M2** Specifications for a recorder for search receivers. (Technical Memorandum No. 411-50A.) (n.a.) OEMsr-411; Research Project No. RP-276. Harvard University, Radio Research Laboratory. February 2, 1944.

- M3** [The] D-1800 recorder, AN/APA-23. (Technical Memorandum No. 411-50B.) H. E. Overacker. OEMsr-411; Research Project No. RP-276. Harvard University, Radio Research Laboratory. May 11, 1944.

- M4** Flight tests of AN/APA-23 recorder. (Report No. 411-173.) R. E. Anderson. OEMsr-411; Research Project No. RP-276. Harvard University, Radio Research Laboratory. April 12, 1945.

311.4 Panoramic Search Receivers

- M1** Panoramic receiver, Panther. (Report No. 1305-21.) Wilmer C. Anderson and Arthur C. Weid. OEMsr-1305; Project Nos. RP-363, SC-98.07 and NA-109. Airborne Instruments Laboratory, Inc. August 31, 1945.

311.5 Miscellaneous Search Receiver Problems

- M1** Probability formulas for simultaneous periodically recurring events. (Report No. 411-171.) Paul I. Richards. OEMsr-411; Research Project No. RP-286. Harvard University, Radio Research Laboratory. May 5, 1945.

- M2** The effect of signal-intercept probabilities on search receiver design. (Report No. 411-272.) George E. Hulstede. OEMsr-411; Research Project No. RP-286. Harvard University, Radio Research Laboratory. October 10, 1945.

312 Airborne Warning Receivers

312.1 Zero Catcher

- M1** Wide-band radar warning receivers, Zero Catchers. (Report No. 9.) Robert B. Barnes. Research Project No. A-700. Harvard University, Radio Research Laboratory. January 21, 1943.

- M2** Noise and hum reduction in installations of RC-164 equipment in large airplanes. (Report No. 52.) Seymour B. Cohn. Research Project No. A-2100. Harvard University, Radio Research Laboratory. July 23, 1943.

- M3** [The] R-800 early warning receiver, Zero Catcher II. (Technical Memorandum No. 411-111.) Seymour B. Cohn. OEMsr-411; Research Project No. RP-287. Harvard University, Radio Research Laboratory. May 6, 1944.

- 312.2 Boozer**
M1 Tests of British Boozer, Model R-1618. (Technical Memorandum No. 411-21.) Seymour B. Cohn. OEMsr-411. Harvard University, Radio Research Laboratory. January 4, 1944.
- 313 Direction Finding Receivers and Homing Devices**
M1 The use of continuously rotating direction finders against signals of varying intensity. (Report No. 411-158.) Donald Foster. OEMsr-411; Research Project No. RP-318. Harvard University, Radio Research Laboratory. February 17, 1945.
- 313.1 Airborne**
- 313.11 Naval Systems**
M1 Flight test of Navy Type X-DBA radio direction finder on B-24J aircraft. (Report No. 936-4.) H. H. Buttner. OEMsr-936. Federal Telephone and Radio Corporation. January 18, 1945.
M2 [The] NLS-694 aircraft radio direction finding equipment. (Final Report No. 1458-2.) H. Busignies, Trevor H. Clark and Henry B. Scarborough. OEMsr-1458; Project Nos. RP-444, SC-97.06 and others. Federal Telephone and Radio Corporation. September 29, 1945.
- 313.111 C-1906**
M1 [The] C-1906 azimuth homing system, Navy AN/APA-48. (Report No. 411-198.) John W. Christensen. OEMsr-411; Project Nos. RP-209, NS-202 and others. Harvard University, Radio Research Laboratory. June 28, 1945.
M2 Field test of Crash Model C-1906 homing device. (Report No. 411-227.) John J. Wittkopf. OEMsr-411; Project Nos. RP-209 and NS-397.10. Harvard University, Radio Research Laboratory. August 11, 1945.
- 313.12 C-1700 (Fanny)**
M1 Operating instructions for the C-1700 homing device attachment, Fanny. (Report No. 30.) Paul H. Reedy. Harvard University, Radio Research Laboratory. March 13, 1943.
- 313.13 C-1900**
M1 C-1900 very high frequency homing methods and homing equipment. (Report No. 411-168. Revised Edition.) John W. Christensen. OEMsr-411; Project Nos. RP-209, NS-312 and others. Harvard University, Radio Research Laboratory. April 10, 1945.
- 313.14 C-2100 (AN/APA-42)**
M1 The C-2100 airborne direction finder. (Technical Memorandum Nos. 411-61, -61A and -61B.) John W. Christensen. OEMsr-411; Research Project No. RP-298. Harvard University, Radio Research Laboratory. February 7, March 22 and May 23, 1944.
- M2** Tests of AN/APA-24 (C-2100 setter) airborne direction finding equipment. (Technical Memorandum No. 411-61C.) R. L. Hammett and F. M. Wrightson. OEMsr-411; Research Project No. RP-298. Harvard University, Radio Research Laboratory. June 21, 1944.
- M3** Modification of AN/APA-42 for bottom mounting in B-29. (Report No. 411-208.) John J. Wittkopf. OEMsr-411; Project Nos. RP-298 and AC-297.07. Harvard University, Radio Research Laboratory. July 23, 1945.
- 313.15 M-2300 and M-3100 (AN/APA-17)**
(See also: 331.2)
M1 Preliminary specifications for the M-2300 direction finding system. (Technical Memorandum No. 411-46.) Arthur Dorne. OEMsr-411; Research Project No. RP-298. Harvard University, Radio Research Laboratory. November 12, 1943.
M2 [The] M-3100 homing device. (Technical Memorandum No. 411-67.) Peter L. Harbury. OEMsr-411; Research Project No. RP-298. Harvard University, Radio Research Laboratory. February 1, 1944.
- 313.2 Shipboard**
M1 Considerations affecting choice of direction finder deception systems. (Report No. 895-9.) H. O. Peterson and Warren H. Bliss. OEMsr-895; Research Project No. RP-252. Radio Corporation of America. December 16, 1943.
M2 Broad-band direction finding system. (Report No. 1045-12.) J. V. Granger. OEMsr-1045; Research Project No. RP-982; OSRD Liaison Office No. WA-4390-11a. Harvard University, American-British Laboratory. April 23, 1945.
- 313.21 M-2600 (CXGA)**
M1 Shipborne tests of M-2600 (CXGA) radar and radio direction finder. (Report No. 411-109.) J. D. Kraus, H. K. Clark and A. N. Morgan. OEMsr-411; Research Project No. RP-271. Harvard University, Radio Research Laboratory. October 11, 1944.
- 313.22 M-4100 (DBM-1)**
(See also: 331.4)
M1 Tests of M-4100 system installed on *USS Gunason*. (Report No. 411-105.) Andrew Alford, W. D. McGuigan and others. OEMsr-411; Research Project No. RP-271. Harvard University, Radio Research Laboratory. September 25, 1944.
M2 Mark 1 of M-4130 modification of AN/SPT-6 radar set for use as variable frequency radar transmitter. (Report No. 411-181.) E. C. Barkofsky. OEMsr-411; Project Nos. RP-271, NS-202 and NS-261. Harvard University, Radio Research Laboratory. April 30, 1945.
M3 Calibration methods for DBM-1 radio and radar direction finder. (Report No. 411-190.) W. D. McGuigan, E. C. Barkofsky and J. D. Kraus. OEMsr-

- 411; Project Nos. RP-271, NS-202 and NS-261. Harvard University, Radio Research Laboratory. July 18, 1945.
- M4** Interpretation of calibration data on shipborne DBM (M-4100) radio and radar direction finder. (Report No. 411-191.) J. D. Kraus and W. D. McGuigan. OEMsr-411; Project Nos. RP-271, NS-202 and NS-261. Harvard University, Radio Research Laboratory. December 8, 1945.
- 313.23 M-7100**
- M1** [The] M-7100 direction finder. (Report No. 411-297.) H. K. Clark, W. D. McGuigan and C. A. Mizen. OEMsr-411; Project Nos. RP-271, NS-397.09 and NS-202. Harvard University, Radio Research Laboratory. January 10, 1946.
- 314 Receiver Accessories**
- 314.1 Amplifiers**
- M1** An i-f amplifier with a variable input impedance. (Report No. 931-26.) R. L. Watters. OEMsr-931; Project Nos. RP-392, SC-99.06 and AC-299.06. General Electric Company. November 8, 1945.
- 314.2 Indicators**
- 314.21 Types**
- M1** Preliminary operating instructions for [the] Y-700 bandwidth adjustment indicator. (Technical Memorandum No. 411-95.) Leonard A. Mayberry. OEMsr-411; Research Project No. RP-293. Harvard University, Radio Research Laboratory. February 10, 1944.
- M2** Quado indicator. (Report No. 895-18.) W. A. Anderson. OEMsr-895; Research Project No. RP-263. Radio Corporation of America. April 12, 1944.
- M3** Quado dual indicator. (Report No. 895-37.) W. A. Anderson. OEMsr-895; Research Project No. RP-263. Radio Corporation of America. January 27, 1945.
- 314.22 Screens**
- M1** The use of dark-trace tubes for integration. (Report No. 867-6.) Martin M. Freundlich and Robert Serrell. Columbia Broadcasting System, Inc. December 16, 1943.
- 315 Miscellaneous Receiver Problems**
- M1** Preliminary experimental results with the Z-3600 repeater. (Report No. 411-107.) Harvey Kees and Louis E. Raburn. OEMsr-411. Harvard University, Radio Research Laboratory. October 11, 1944.
- 320 Jamming Transmitters**
- M1** Radio Research Laboratory transmitter situation. (Technical Memorandum No. 411-58.) George E. Hulstede. OEMsr-411. Harvard University, Radio Research Laboratory. January 29, 1944.
- 321 Communications Jamming Systems**
- 321.1 Airborne**
- M1** High-power barrage jammer. (Report No. 940-2.) L. G. Young. OEMsr-940; Research Project No. RP-155. Bell Telephone Laboratories, Inc. July 15, 1943.
- M2** Barrage jammer. (Report No. 940-3.) L. G. Young and G. V. Dale. OEMsr-940; Research Project No. RP-153. Bell Telephone Laboratories, Inc. August 17, 1943.
- 321.11 Dina (Low-Frequency)**
- M1** Simplified double side-band 50-watt Dina. (Report No. 940-1.) R. C. Shaw. OEMsr-940; Research Project No. RP-199. Western Electric Company, Inc. June 24, 1943.
- M2** Field tests of Dina and Dinamate at Wright Field, August 15, 1943. (Report No. 61.) Harvey Kees and Louis E. Raburn. Harvard University, Radio Research Laboratory. September 21, 1943.
- M3** Development of a lightweight Dina transmitter. (Report No. 940-12.) R. J. Kircher and R. W. Friis. OEMsr-940; Research Project No. RP-199. Bell Telephone Laboratories, Inc. January 28, 1944.
- M4** The B-3200-B-2900 Dina-Dinamate transceiver. (Technical Memorandum No. 411-20.) Harvey Kees. OEMsr-411; Research Project Nos. RP-250 and RP-267. Harvard University, Radio Research Laboratory. February 9, 1944.
- 321.12 AN/ART-2 (PAD)**
- M1** Preliminary specification of 920-11-E jamming transmitter. (Report No. 940-7.) J. C. Schelleng. OEMsr-940; Research Project No. RP-199. Bell Telephone Laboratories, Inc. October 1, 1943.
- M2** Use of the self-quenched oscillator in the PAD barrage jamming transmitter. (Report No. 940-11.) A. E. Kerwien. OEMsr-940; Research Project No. RP-199. Bell Telephone Laboratories, Inc. January 3, 1944.
- M3** Effectiveness tests of PAD, AN/ART-2, used against amplitude modulation nets. (Report No. 966-30.) V. A. Douglas. OEMsr-966; Project No. RP-109. Bell Telephone Laboratories, Inc. May 9, 1944.
- M4** Improved jamming action of multiple PAD, AN/ART-2, transmitters. (Report No. 940-16.) W. J. Albersheim and F. F. Merriam. OEMsr-940; Research Project No. RP-199. Bell Telephone Laboratories, Inc. October 2, 1944.
- M5** Prototype model production [of] PAD. (Report No. 1179-1.) (n.a.) OEMsr-1179. Midwest Radio Corporation. December 13, 1944.

321.13 Miscellaneous Airborne Systems

M1 A low-power spot jamming transmitter, A-3500. (Technical Memorandum No. 411-76.) W. R. Rambo. OEMsr-411; Research Project No. RP-203. Harvard University, Radio Research Laboratory. March 27, 1944.

321.2 Components**321.21 Amplifier**

M1 [The] AN/ARQ-13 500-watt amplifier for AN/ARQ-10 equipment, NLS-636. (Report No. 1275-1.) C. R. Muller and P. Sokoloff. OEMsr-1275; Project Nos. RP-200 and NS-128. Federal Telephone and Radio Corporation. March 25, 1946.

321.22 Oscillator

M1 Handbook of instructions [for the] audio oscillator, O-28/ARQ-11. (Report No. 1305-8.) (n.a.) OEMsr-1305; Research Project No. RP-419a. Airborne Instruments Laboratory, Inc. March 19, 1945.

321.23 Miscellaneous Components

M1 Gear reduction unit. (Technical Memorandum No. 1305-1.) T. F. Tomlines. OEMsr-1305; Research Project No. RP-419a. Airborne Instruments Laboratory, Inc. March 27, 1945.

M2 Handbook of instructions for R-21/ARQ-11, radio receiver. (Report No. 1305-14.) (n.a.) OEMsr-1305; Project Nos. RP-419a and SC-95.14. Airborne Instruments Laboratory, Inc. June 30, 1945.

M3 Handbook of instructions for PP-130/ARQ-11, rectifier, and C-187/ARQ-11, control unit. (Report No. 1305-15.) (n.a.) OEMsr-1305; Project Nos. RP-419a and SC-95.14. Airborne Instruments Laboratory, Inc. June 30, 1945.

321.3 Conversion and Modification of Communications Equipment for Jamming Purposes

M1 Conversion of standard radio equipment to jamming equipment. (Report No. 778-2.) M. E. Campbell. OEMsr-778. Western Electric Company, Inc. November 11, 1942.

M2 Conversion of GO-9 for radio countermeasures purposes. (Preliminary Report No. 966-3.) H. H. Benning. OEMsr-966. Western Electric Company, Inc. March 24, 1943.

M3 Conversion of GO-9 for radio countermeasures purposes. (Report No. 966-16.) H. H. Benning and W. E. Evans. OEMsr-966. Bell Telephone Laboratories, Inc. September 21, 1943.

M4 Modification of the SCR-808 for jamming purposes. (Report No. 966-10.) V. A. Douglas and W. E. Evans. OEMsr-966; Research Project No. RP-148. Bell Telephone Laboratories, Inc. November 23, 1943.

M5 Conversion of intermediate frequency unit of GO-9 transmitter for telegraph radio counter-

measures purposes. (Report No. 966-29.) V. L. Dzwonczyk. OEMsr-966; Research Project No. RP-148. Bell Telephone Laboratories, Inc. May 23, 1944.

322 Radar Jamming Systems**322.1 Airborne, Shipboard and Ground****322.11 AN/APQ-2 (Rug)**

M1 Low-frequency modification of the Rug transmitter, AN/APQ-2. (Report No. 411-206.) E. A. Yunker. OEMsr-411; Project Nos. RP-164 and AC-294.28. Harvard University, Radio Research Laboratory. June 23, 1945.

M2 Low-frequency modification of the Rug transmitter, AN/APQ-2. (Supplementary Report No. 411-254.) James L. Clark. OEMsr-411; Research Project No. RP-164. Harvard University, Radio Research Laboratory. September 25, 1945.

322.12 Carpet**322.121 AN/APQ-9**

M1 Note on barrage jamming with special reference to use of RC-156 and AN/APQ-9 transmitters. (Technical Memorandum No. 411-11.) Warren D. White. OEMsr-411; Research Project Nos. RP-165 and RP-166. Harvard University, Radio Research Laboratory. July 9, 1943.

M2 Methods of selecting and setting the frequency of RC-156 and AN/APQ-9 Carpet transmitters. (Technical Memorandum No. 411-14.) John N. Dyer. OEMsr-411; Research Project Nos. RP-165 and RP-166. Harvard University, Radio Research Laboratory. July 9, 1943.

M3 [The] F-2500 higher-power Carpet transmitter, Carpet III, Radio Research Laboratory prototype of AN/APQ-9. (Report No. 62.) James L. Clark. Harvard University, Radio Research Laboratory. September 30, 1943.

322.122 AN/APT-2

M1 Single-dial operation of Carpet I, AN/APT-2. (Report No. 411-150.) Elton Barrett and A. Ellis. OEMsr-411; Research Project No. RP-165. Harvard University, Radio Research Laboratory. January 12, 1945.

322.123 AN/APT-5

M1 [The] AN/APT-5 (XA-2C) and AN/APT-5 transmitters (F-3500). (Technical Memorandum No. 411-120.) (n.a.) OEMsr-411; Research Project No. RP-336. Harvard University, Radio Research Laboratory. July 7, 1944.

M2 A modification to the F-3500 (AN/APT-5, AN/APT-6) transmitter to improve the power output in the 350- to 700-mc range. (Report No. 411-142.) H. C. Kriegel. OEMsr-411; Research Project No.

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RP-336. Harvard University, Radio Research Laboratory. December 26, 1944.

- M3** Barrage suitability of AN/APT-5. (Report No. 411-196.) J. F. Youngblood. OEMsr-411; Project Nos. RP-336 and AC-298.04. Harvard University, Radio Research Laboratory. June 8, 1945.

322.124 RC-156

- M1** The F-902, Carpet I, airborne jamming transmitter, Radio Research Laboratory prototype of Army RC-156 and Navy CXCD. (Report No. 45.) E. A. Yunker. Harvard University, Radio Research Laboratory. July 20, 1943.
- M2** Modifications to make RC-156-A Carpet transmitter operate in the 335- to 415-mc band. (Report No. 1045-3.) J. T. Wilner. OEMsr-1045; OSRD Liaison Office No. WA-2151-1a. Harvard University, American-British Laboratory. January 20, 1944.
- M3** Preliminary test report on the RC-156 as a spot jammer. (Technical Memorandum No. 411-89.) E. F. Vidro. Harvard University, Radio Research Laboratory. February 8, 1944.
- M4** Test Report No. 4 of the RRL Test Laboratory on the F-2500 Carpet III. (Technical Memorandum No. 411-96.) R. B. Monroe and R. R. Rhiger. OEMsr-411; Research Project No. RP-166. Harvard University, Radio Research Laboratory. April 14, 1944.
- M5** A study of the radio countermeasures requirements of the 8th and 9th Air Forces. (Report No. 1045-9.) W. E. Evans. OEMsr-1045. Harvard University, American-British Laboratory. June 20, 1944.
- M6** Carpet transmitter modification. (Report No. 411-117.) Elton Barrett. OEMsr-411; Research Project No. RP-165. Harvard University, Radio Research Laboratory. October 17, 1944.
- M7** The barrage suitability of Carpet I and III with or without Window. (Test Report No. 411-151.) J. J. Youngblood. OEMsr-411. Harvard University, Radio Research Laboratory. January 25, 1945.
- M8** Modifications to Carpet I (AN/APT-2), Carpet III (AN/APQ-9) and Rug (AN/APQ-2) transmitters for spot frequency jamming. (Technical Memorandum No. 1045-4.) J. Gregg Stephenson. OEMsr-1045; Research Project No. RP-997; OSRD Liaison Office No. WA-4143-1. Harvard University, American-British Laboratory. February 27, 1945.

322.13 AN/APT-1 (Dina)

- M1** Energy spectrum of the B-2200 AN/APT-1, Dina transmitter. (Technical Memorandum No. 411-59.) P. P. Robbiano and R. E. Reid. OEMsr-411; Research Project No. RP-309. Harvard University, Radio Research Laboratory. September 24, 1943.
- M2** [The] B-2200 transmitter, Dina (AN/APT-1).

(Technical Memorandum No. 411-110.) (n.a.) OEMsr-411; Research Project No. RP-309. Harvard University, Radio Research Laboratory. May 8, 1944.

322.14 AN/APT-3 (or RC-183, Mandrel)

- M1** The Radio Research Laboratory Mandrel transmitter, Army RC-183. (Report No. 35.) Charles W. Oliphant. Harvard University, Radio Research Laboratory. May 21, 1943.
- M2** Modifications on the RC-183, Mandrel. (Technical Memorandum No. 411-19.) E. L. Plotts. OEMsr-411; Research Project No. RP-163. Harvard University, Radio Research Laboratory. August 6, 1943.
- M3** Energy spectrum of the B-2000 RC-183, Mandrel transmitter. (Technical Memorandum No. 411-19A.) R. E. Reid and P. P. Robbiano. OEMsr-411; Research Project No. RP-163. Harvard University, Radio Research Laboratory. September 24, 1943.

322.15 AN/APT-4

- M1** [The] F-3400 magnetron transmitter, AN/APT-4. (Technical Memorandum No. 411-114.) (n.a.) OEMsr-411; Research Project No. RP-338. Harvard University, Radio Research Laboratory. May 16, 1944.
- M2** Broad-band tests of AN/APT-4 (XA-2) transmitter in the Wurzburg radar band. (Report No. 411-108.) Warren D. White. OEMsr-411; Research Project No. RP-338. Harvard University, Radio Research Laboratory. October 11, 1944.
- M3** Single-dial operation of AN/APT-4 (XA-2), F-3400 magnetron transmitter. (Report No. 411-139.) Louis E. Raburn and G. R. Bridgeford. OEMsr-411; Research Project No. RP-338. Harvard University, Radio Research Laboratory. December 19, 1944.
- M4** Availability of direct-current power for radio countermeasures in B-17 and B-24 aircraft. (Technical Memorandum No. 1045-7.) Milton B. Adams. OEMsr-1045; Research Project No. RP-987; OSRD Liaison Office No. WA-4446-13B. Harvard University, American-British Laboratory. May 7, 1945.
- M5** Jamming effectiveness of APT-4 (XA-2) against Small Wurzburg and Synthetic Giant Wurzburg. (Report No. 411-204.) D. F. Wartzok. OEMsr-411; Project Nos. RP-338 and AC-294.12. Harvard University, Radio Research Laboratory. July 12, 1945.
- M6** Jamming effectiveness of APT-4 against SCR-545-A. (Report No. 411-204A.) D. F. Wartzok. OEMsr-411; Project Nos. RP-338 and AC-294.12. Harvard University, Radio Research Laboratory. September 20, 1945.

322.16 Miscellaneous Transmitters

- M1** Preliminary instruction book [for the] B-1600

transmitter. (Report No. 3.) John F. Byrne. Harvard University, Radio Research Laboratory. October 16, 1942.

- M2** [The] 100-mc airborne jamming transmitter, B-1700 (Navy CXCE). (Report No. 15.) Louis E. Raburn. Harvard University, Radio Research Laboratory. March 13, 1943.

322.2 Component Parts

322.21 Amplifiers

- M1** Preliminary specifications for B-2800 high-power Dina amplifier. (Technical Memorandum No. 411-16.) John B. Caraway. OEMsr-411; Research Project No. RP-218. Harvard University, Radio Research Laboratory. August 4, 1943.
- M2** Preliminary specifications for B-3400 Dina amplifier. (Technical Memorandum No. 411-48.) John B. Caraway. OEMsr-411; Research Project No. RP-329. Harvard University, Radio Research Laboratory. October 26, 1943.
- M3** [The] B-3100 double-peaking device. (Technical Memorandum No. 411-52.) Leonard A. Mayberry. OEMsr-411; Research Project No. RP-293. Harvard University, Radio Research Laboratory. November 29, 1943.
- M4** Development of AM-66/AR-XR radio amplifier. (Report No. 940-20.) L. G. Young, N. F. Schlaack and others. OEMsr-940; Research Project No. RP-272. Bell Telephone Laboratories, Inc. February 3, 1945.
- M5** Comparison of AM-33 and AM-66 amplifiers. (Report No. 966-48.) M. E. Campbell, C. R. Eckberg and M. C. Francis. OEMsr-966; Research Project No. RP-272B. Bell Telephone Laboratories, Inc. March 15, 1945.
- M6** Modifications of the AM-33/ART amplifier. (Report No. 411-223.) W. R. Rambo and G. R. Bridgeford. OEMsr-411; Research Project No. RP-344. Harvard University, Radio Research Laboratory. September 11, 1945.

323 Miscellaneous Transmitter Problems

- M1** High-power resnatron jamming transmitters. Preliminary specifications for mobile units. (Technical Memorandum No. 411-7.) W. W. Salisbury. OEMsr-411; Research Project No. RP-100. Harvard University, Radio Research Laboratory. May 27, 1943.
- M2** Efficiency of spark transmitters. (Report No. 940-4.) Charles R. Burrows. OEMsr-940; Research Project No. RP-199. Bell Telephone Laboratories, Inc. August 24, 1943.
- M3** Jammer frequency setting. (Technical Memorandum No. 411-27.) Matthew T. Lebenbaum. OEMsr-411; Research Project No. RP-327. Harvard University, Radio Research Laboratory. November 9, 1943.
- M4** Low-frequency spark-over in air at low pressures. (Technical Memorandum No. 411-47.) John P.

Woods. OEMsr-411; Research Project No. RP-178. Harvard University, Radio Research Laboratory. January 20, 1944.

330 Antennas

- M1** Antennas for radio countermeasures. (Report No. 411-100. Handbook Series HB-2.) Andrew W. Alford. [OEMsr-411.] Harvard University, Radio Research Laboratory. November 1, 1944.
- M2** Antennas for radio countermeasures. Part II, Bibliography of radio countermeasures antenna information. (RCM Handbook No. HB-2s.) Robert Serrell. OEMsr-867. Columbia Broadcasting System, Inc. March 15, 1945.
- M3** [Antennas.] Final Report No. 759-34 on Contract OEMsr-759. George Sinclair and Paul H. Nelson. OEMsr-759; Research Project Nos. RP-137, RP-269 and RP-427. Ohio State University. October 18, 1945.
- M4** Antennas for radio countermeasures. (Report No. 411-100A. Handbook Series HB-2A. Revised edition of 411-100.) Andrew W. Alford. OEMsr-411. Harvard University, Radio Research Laboratory. December 3, 1945.

331 Receiving Antennas

331.1 Airborne Receiving Antennas

- M1** Antenna patterns for aircraft. Covering studies and experimental investigations in connection with antenna patterns for aircraft. George Sinclair. NDCrc-100. Ohio State University. August 31, 1942.
- M2** The patterns of an antenna array for the SCR-587 on the B-17F. (Report No. 759-7.) George Sinclair. [OEMsr-759.] Ohio State University. February 20, 1943.
- M3** Note on the patterns of antennas for Gymnast. (Report No. 759-9.) George Sinclair. [OEMsr-759.] [Ohio State University.] March 25, 1943.
- M4** Antenna patterns on the Hairy Butterfly, frequency 100 mcs. (Report No. 759-10.) George Sinclair. [OEMsr-759.] Ohio State University. May 15, 1943.
- M5** Antenna patterns on the Hairy Butterfly. (Report No. 759-11.) Robert B. Jacques. [OEMsr-759.] Ohio State University. June 25, 1943.
- M6** Optimum directivity pattern for search antennas. (Report No. 411-192.) Donald Foster. OEMsr-411; Project Nos. RP-107 and SC-90.14. Harvard University, Radio Research Laboratory. May 23, 1945.
- M7** Method of installation and pattern measurement of C-1950 series homing antennas (AN/APA-48) in various type aircraft. (Report No. 411-213.) John W. Christensen. OEMsr-411; Project Nos. RP-209, NS-202 and others. Harvard University, Radio Research Laboratory. September 11, 1945.

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331.11 Stub and Cone

- M1** Airborne antennas for AN/APR-1. (Technical Memorandum No. 411-92.) C. Milton Daniell and M. J. White. OEMsr-411; Research Project No. RP-144. Harvard University, Radio Research Laboratory. March 31, 1944.
- M2** Photographs and characteristics of the M-801 antenna assembly for the RC-160 (C-1100) autosearch receiver. (Technical Memorandum No. 411-93.) C. Milton Daniell. OEMsr-411; Research Project No. RP-138. Harvard University, Radio Research Laboratory. March 31, 1944.

331.111 Stub

- M1** Patterns of nose antennas on the AT-11. (Report No. 759-5.) George Sinclair. [OEMsr-759.] [Ohio State University.] January 21, 1943.
- M2** Antennas for the RC-164. (Report No. 759-8.) George Sinclair. [OEMsr-759.] Ohio State University. March 17, 1943.
- M3** The AT-52/APT, AT-53/APT and AT-54/APT (M-313) stub antenna masts, and assemblies which include them. (Report No. 411-153.) Peter L. Harbury. OEMsr-411; Research Project No. RP-138. Harvard University, Radio Research Laboratory. January 29, 1945.

331.112 Cone

- M1** Patterns of cone antennas on a B-24. (Report No. 759-3.) George Sinclair. [OEMsr-759.] Ohio State University. December 20, 1942.
- M2** [The] AS-44/APR (A-2602) antenna for the AN/APR-5 (A-2600) microwave receiver, 1000 to 3100 mc. (Technical Memorandum No. 411-77.) Compiled by: H. C. Singleton. OEMsr-411; Research Project No. RP-135. Harvard University, Radio Research Laboratory. February 25, 1944.
- M3** [The] AS-29/APR (M-2101) broad-band cone antenna, 300 to 3300 mc. (Technical Memorandum No. 411-79.) Compiled by: H. C. Singleton. OEMsr-411; Research Project No. RP-138. Harvard University, Radio Research Laboratory. February 28, 1944.
- M4** The A-2602, A-2608 and A-2612 cone antennas. (Technical Memorandum No. 411-113.) Peter L. Harbury. OEMsr-411; Research Project No. RP-135. Harvard University, Radio Research Laboratory. July 13, 1944.

331.12 Dipole

- M1** Patterns of a dipole on a Type AT-11 for 110 mc. (Report No. 759-4.) George Sinclair. [OEMsr-759.] Ohio State University. December 28, 1942.
- M2** Operational use of the AN/APA-24 direction finding antenna on B-29 aircraft of the XX bomber command. (Report No. 411-180.) John J. Wittkopf. OEMsr-411. Harvard University, Radio Research Laboratory. April 28, 1945.

331.13 Loop

- M1** Antenna patterns of special loop on A-29 Lockheed Hudson bomber. (Report No. 759-12.) Robert B. Jacques. [OEMsr-759.] Ohio State University. July 24, 1943.
- M2** Antenna system for Project Moth. (Report No. 867-1.) Robert Serrell. OEMsr-867; Research Project No. RP-261. Columbia Broadcasting System, Inc. November, 1943.
- M3** Modeling the direction finding loop antenna. Application to a model of a B-24 aircraft. (Report No. 100-3.) Wayne E. Rife. NDCrc-100; Project Nos. RP-404 and AC-297.04. Ohio State University. June 11, 1945.

331.14 Sleeve

- M1** Sleeve antenna, BC-900. (Report No. 1045-6.) R. F. Lewis and G. H. Klemm. OEMsr-1045. Harvard University, American-British Laboratory. April 17, 1944.
- M2** Sleeve antenna, BC-500. (Report No. 1045-7.) R. F. Lewis and G. H. Klemm. OEMsr-1045. Harvard University, American-British Laboratory. April 17, 1944.

331.15 Whip

- M1** Antenna patterns of vertical antennas on B-17 and B-24 bombers, frequency 35 mc. (Report No. 759-13.) Robert B. Jacques. [OEMsr-759.] Ohio State University. August 2, 1943.

331.16 Slot

- M1** The M-6804 antennas. (Preliminary Report No. 411-166.) David Lazarus. OEMsr-411; Research Project No. RP-303. Harvard University, Radio Research Laboratory. March 26, 1945.

331.2 Airborne Direction Finding Antenna-Spinner Assemblies (See also: 313.15)

- M1** The M-4500 spinner for the M-2300, M-2600, M-3000 and M-4100 systems. (Technical Memorandum No. 411-35.) Peter L. Harbury. OEMsr-411; Research Project No. RP-271. Harvard University, Radio Research Laboratory. November 29, 1944.
- M2** Tabulation of antenna spinner assemblies for Group M direction finding systems. (Report No. 411-134.) J. D. Kraus. OEMsr-411. Harvard University, Radio Research Laboratory. December 4, 1944.
- M3** Preliminary instruction book for M-6200 (AS-222/APA-17) antenna system. (Report No. 411-IB-90.) H. K. Clark, S. Beraducci and J. D. Kraus. OEMsr-411; Research Project No. RP-298. Harvard University, Radio Research Laboratory. April 19, 1945.
- M4** Operation and maintenance of M-6400 antenna system. ([Instruction Book] No. 411-IB-86.) H. K. Clark. OEMsr-411; Project Nos. RP-298 and NS-

202. Harvard University, Radio Research Laboratory. August 26, 1945.

- M5** [The] M-6600 X-band antenna and drive assembly for use with M-3000 (AN/APA-17) airborne direction finder. (Report No. 411-287.) E. C. Barkofsky. OEMsr-411; Project Nos. RP-298, NS-202 and NS-397.07. Harvard University, Radio Research Laboratory. November 19, 1945.

331.3 Shipboard Receiving Antennas

331.31 Cone and Dipole

- M1** [The] AS-56/APR (M-2408) shipboard dipole antenna, 75 to 300 mc. (Technical Memorandum No. 411-80.) Compiled by: H. C. Singleton. OEMsr-411; Research Project No. RP-138. Harvard University, Radio Research Laboratory. February 28, 1944.
- M2** [The] AS-56/SPR (M-2409) shipboard cone dipole antenna. (Technical Memorandum No. 411-81.) Compiled by: H. C. Singleton. OEMsr-411; Research Project No. RP-138. Harvard University, Radio Research Laboratory. February 29, 1944.
- M3** Comparative field intensity response of M-2409 cone dipole, and M-801 single cone antennas. (Technical Memorandum No. 411-55.) E. L. Bock. OEMsr-411; Research Project No. RP-138. Harvard University, Radio Research Laboratory. June 23, 1944.
- M4** Circularly polarized search antennas for the band 2100 to 4000 mc. (Report No. 411-283.) R. M. Hatch, Jr. and C. C. Loomis. OEMsr-411; Project Nos. RP-303, NS-394.10 and NS-394.18. Harvard University, Radio Research Laboratory. October 31, 1945.

331.32 Miscellaneous Antennas

- M1** [The] 5- to 10-cm search antennas for naval installations of the AN/APR-5A receiver. (Technical Memorandum No. 411-143.) Walter G. Wadey. OEMsr-411; Research Project No. RP-107. Harvard University, Radio Research Laboratory. September 7, 1944.
- M2** [The] M-6300 antennas. (Preliminary Report No. 411-114.) E. L. Bock and J. A. Nelson. OEMsr-411; Research Project No. RP-138. Harvard University, Radio Research Laboratory. October 23, 1944.

331.4 Shipboard Direction Finding Antenna-Spinner Assemblies

(See also: 313.22)

- M1** The M-6120 broad-band antenna spinner for the M-4100 (DBM) direction finding system. (Report No. 411-233.) J. D. Kraus, H. K. Clark and S. Beraducci. OEMsr-411; Project Nos. RP-271 and NS-202. Harvard University, Radio Research Laboratory. September 8, 1945.
- M2** [The] M-6700 shipborne direction finding antenna. (Report No. 411-243.) G. Stavis. OEMsr-411; Project Nos. RP-271, NS-202 and NS-397.07. Har-

vard University, Radio Research Laboratory. September 11, 1945.

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Transmitting Antennas

- M1** Preliminary antenna measurements on a model of [the] Hs-293 glider bomb. (Report No. 1305-1.) L. K. Findley. Research Project No. RP-382. Airborne Instruments Laboratory, Inc. April 24, 1944.
- M2** Flight tests of an AN/APA-24 antenna with electric drive. (Report No. 411-156.) O. W. Whitby. OEMsr-411; Research Project No. RP-284. Harvard University, Radio Research Laboratory. February 5, 1945.
- M3** Graphs useful in determining optimum height of jamming antennas. (Report No. 411-202.) H. Clark and E. F. Shaw. OEMsr-411; Project Nos. RP-299 and SC-94.22. Harvard University, Radio Research Laboratory. August 13, 1945.

332.1 Airborne

332.11 M-2200 (Fishhook)

- M1** [The] M-2201 antenna. (Technical Memorandum No. 411-53.) C. Milton Daniell. OEMsr-411; Research Project No. RP-138. Harvard University, Radio Research Laboratory. December 3, 1943.
- M2** The M-2202 antenna. (Technical Memorandum No. 411-54.) C. Milton Daniell. OEMsr-411; Research Project No. RP-279. Harvard University, Radio Research Laboratory. February 16, 1944.
- M3** Preliminary instruction sheet on the M-2204 antenna. ([Instruction Book] No. 411-IB-65.) J. A. Nelson and C. Milton Daniell. OEMsr-411; Research Project No. RP-303. Harvard University, Radio Research Laboratory. February 13, 1945.
- M4** Modification kit for AS-69/APT (M-2202) antenna for operation in the 450 [to] 500-mc band. (Technical Memorandum No. 1045-6.) G. H. Klemm. OEMsr-1045; Research Project No. RP-303; OSRD Liaison Office No. WA-4363-1. Harvard University, American-British Laboratory. April 19, 1945.
- M5** Performance of the AS-251/AP (M-2204) antenna system when mounted in metallic recesses. (Report No. 411-216.) John Allen. OEMsr-411; Project Nos. RP-303, AC-290.14 and AC-294.17. Harvard University, Radio Research Laboratory. September 19, 1945.
- M6** A review of data on the M-2200 Fishhook antennas. (Report No. 411-298.) Andrew Alford. OEMsr-411; Project Nos. RP-303, SC-83 and others. Harvard University, Radio Research Laboratory. March 6, 1946.

332.12 M-2800 (AN/APT-1 and -3, Stub and Balun)

- M1** Assembly and installation instructions for the M-2803 and M-2804 antenna systems. ([Instruction Book] No. 411-IB-33.) J. Margolin. OEMsr-411. Harvard University, Radio Research Laboratory. June 2, 1944.

332.121 M-4000 and M-6300 (Stub)

M1 [The] M-6302 skirted stub antenna. (Report No. 411-120.) J. A. Nelson. OEMsr-411; Project Nos. RP-138 and NA-178. Harvard University, Radio Research Laboratory. September 28, 1945.

M2 M-4000 antennas. (Report No. 411-291.) H. M. Horton, J. A. Nelson and D. I. Wilhoit. OEMsr-411; Project Nos. RP-303, SC-94.15 and others. Harvard University, Radio Research Laboratory. January 3, 1946.

332.13 M-3200 (AN/APQ-2 and AN/APT-5)

M1 M-3203 antennas. (Technical Memorandum No. 411-122.) Clare Driscoll. OEMsr-411; Research Project No. RP-303. Harvard University, Radio Research Laboratory. June 12, 1944.

332.14 M-3300 (AN/APT-2 and AN/APT-5, Split-Can)

M1 Split-can antennas for horizontal polarization. (Technical Memorandum No. 411-34.) Andrew Alford and Peter L. Harbury. OEMsr-411. Harvard University, Radio Research Laboratory. December 13, 1943.

M2 Preliminary instruction sheet for the M-3301 antenna. ([Instruction Book] No. 411-IB-46.) Clare Driscoll. OEMsr-411; Research Project No. RP-303. Harvard University, Radio Research Laboratory. February 5, 1945.

332.15 M-4900 (AN/APQ-20, Horn)

M1 Preliminary instruction book for the M-4902 airborne S-band circularly polarized radiator. ([Instruction Book] No. 411-IB-71.) J. G. C. Swinney, Jr. OEMsr-411; Research Project No. RP-303. Harvard University, Radio Research Laboratory. March 12, 1945.

M2 S-band airborne circularly polarized radiator. (Report No. 411-294.) P. Keeler. OEMsr-411; Project Nos. RP-303, AC-294.17 and others. Harvard University, Radio Research Laboratory. November 26, 1945.

332.16 AN-148-A

M1 Modifications of the AN-148-A antenna for radio countermeasures use in the 200-mc region. (Report No. 411-203.) J. Margolin. OEMsr-411; Research Project No. RP-481. Harvard University, Radio Research Laboratory. July 2, 1945.

M2 Radiation characteristics of the modified AN-148-A antenna. (Report No. 411-203A.) M. P. Klein and A. B. Ellis. OEMsr-411; Research Project No. RP-481. Harvard University, Radio Research Laboratory. August 8, 1945.

332.17 Stingeree and Sleeve Type

M1 The Stingeree antenna. (Report No. 966-38.) W. C. Babcock, E. O. Bernard and others. OEMsr-966; Research Project No. RP-410. Bell Telephone Laboratories, Inc. December 9, 1944.

M2 A zero-drag aircraft antenna for ultra high frequency. (Report No. 895-35.) R. S. Wehner. OEMsr-895; Research Project No. RP-260. Radio Corporation of America. January 15, 1945.

M3 Stingeree antenna pattern. (Report No. 966-47.) M. E. Campbell, C. R. Eckberg and M. C. Francis. OEMsr-966; Research Project No. RP-410. Bell Telephone Laboratories, Inc. March 15, 1945.

332.18 Miscellaneous Airborne Transmitting Antennas

M1 A study of three antennas. (Preliminary Report No. 778-5.) W. C. Babcock and S. A. Schelkunoff. Research Project No. C-63. [Bell Telephone Laboratories, Inc.] January 26, 1943.

M2 Adaptation of AS-161/ART and AS-97/ART whip antennas as horizontally polarized radiators in the 75-mc region. (Report No. 411-212.) David Lazarus. OEMsr-411; Research Project No. RP-306. Harvard University, Radio Research Laboratory. June 28, 1945.

332.2 Ground and Shipboard

332.21 F-3700 (AN/SPT-2)

M1 The F-3701 dipole and corner reflector antenna, 450 to 720 mc. (Technical Memorandum No. 411-78.) Compiled by: H. C. Singleton. OEMsr-411; Research Project No. RP-138. Harvard University, Radio Research Laboratory. February 25, 1944.

M2 Preliminary instructions for F-3702 antenna, AS-145/SPT-6. ([Instruction Book] No. 411-IB-58.) (n.a.) OEMsr-411; Research Project No. RP-138. Harvard University, Radio Research Laboratory. February 2, 1945.

332.22 F-3900 (AN/APQ-2)

M1 Preliminary instructions for F-3903 antenna, AS-263/UPT. ([Instruction Book] No. 411-IB-70.) (n.a.) OEMsr-411; Research Project No. RP-138. Harvard University, Radio Research Laboratory. March 7, 1945.

332.23 F-4700 (AN/SPT-6)

M1 Preliminary handbook of maintenance instructions for the F-4700 antenna, AS-236/SPT. ([Instruction Book] No. 411-IB-85.) (n.a.) OEMsr-411; Project Nos. RP-138 and NS-204. Harvard University, Radio Research Laboratory. August 7, 1945.

332.24 M-2500 (AN/APT-1 and -3)

M1 [The] M-2508 ground based corner reflector antenna, 90 to 150 mc. (Technical Memorandum No. 411-82.) Compiled by: H. C. Singleton. OEMsr-411; Research Project No. RP-138. Harvard University, Radio Research Laboratory. February 25, 1944.

M2 [The] M-2511 ground based corner reflector antenna, 150 to 210 mc. (Technical Memorandum No.

411-83.) Compiled by: H. C. Singleton. OEMsr-411; Research Project No. RP-138. Harvard University, Radio Research Laboratory. February 28, 1944.

332.25 M-2900 (AN/SPT-5 and -6)

- M1 [The] M-2903 shipborne antenna. (Technical Memorandum No. 411-140.) E. L. Bock. OEMsr-411; Research Project No. RP-138. Harvard University, Radio Research Laboratory. October 7, 1944.
- M2 Design considerations and characteristics of M-2900 antennas. (Report No. 411-210.) E. L. Bock. OEMsr-411; Project Nos. RP-138, NS-204 and others. Harvard University, Radio Research Laboratory. July 13, 1945.
- M3 Performance and applications of the M-2914 relay. (Report No. 411-218.) G. Stavis. OEMsr-411; Project Nos. RP-138, NS-204 and others. Harvard University, Radio Research Laboratory. July 23, 1945.

332.26 M-4400

- M1 [The] M-4400 high-gain antenna. (Technical Memorandum No. 411-134.) Clare Driscoll. OEMsr-411; Research Project No. RP-138. Harvard University, Radio Research Laboratory. September 6, 1944.

332.27 M-4700

- M1 High-gain antenna for S-band transmitter. (Report No. 411-101.) Clare Driscoll. OEMsr-411; Research Project No. RP-303. Harvard University, Radio Research Laboratory. September 18, 1944.

332.28 Sleeve Type

- M1 The sleeve antenna and use of steel in radiators. (Report No. 895-1.) P. S. Carter. OEMsr-895; Research Project No. RP-260. Radio Corporation of America. July 14, 1943.
- M2 Three antennas. (Report No. 895-2.) R. S. Wehner. OEMsr-895; Research Project No. RP-260. Radio Corporation of America. August 9, 1943.

332.3 Tank-Mounted

- M1 A model method for determining tank antenna patterns. George Sinclair. NDCrc-100. Ohio State University. September 24, 1942.

333 Antenna Factors, Investigation of

333.1 Impedance

- M1 Wide-band cone antennas. (Preliminary Report No. 18.) R. Silliman. Harvard University, Radio Research Laboratory. March 20, 1943.
- M2 Measured impedance characteristics of cylindrical radiators less than one wave length long. (Report No. 34.) C. Milton Daniell. Harvard University, Radio Research Laboratory. April 21, 1943.
- M3 The average characteristic impedance K_0 of fan

dipoles. (Preliminary Report No. 966-5.) W. C. Babcock. [OEMsr-966.] [Bell Telephone Laboratories, Inc.] May 24, 1943.

- M4 Comparison of measured and theoretical impedance characteristics of cylindrical radiators. (Report No. 966-14.) S. A. Schelkunoff. OEMsr-966. Western Electric Company, Inc. June 28, 1943.
- M5 The average characteristic impedance of multi-wire cylindrical cage dipoles. (Preliminary Report No. 966-8.) W. C. Babcock. [OEMsr-966.] [Bell Telephone Laboratories, Inc.] July 1, 1943.
- M6 The input impedance of hollow cylindrical dipoles. (Preliminary Report No. 966-15. Appendix to Report No. [966]-8.) W. C. Babcock. OEMsr-966. Bell Telephone Laboratories, Inc. August 25, 1943.
- M7 Notes on antenna tests at Rocky Point Laboratory. (Report No. 895-10.) P. S. Carter and R. S. Wehner. OEMsr-895; Research Project No. RP-260. [Radio Corporation of America.] December 22, 1943.
- M8 Investigation of long-wire antennas. (Report No. 867-5.) J. A. Nelson. OEMsr-867; Research Project No. RP-261. Columbia Broadcasting System, Inc. January 14, 1944.
- M9 Antenna coupling [in] airborne spot jamming system of Project RP-358. (Report No. 895-17.) P. S. Carter. OEMsr-895; Research Project No. RP-260. Radio Corporation of America. April 11, 1944.

333.2 Radiation Patterns

333.21 Specific Types of Antennas

- M1 Note on the patterns of cone antennas. (Report No. 759-1.) George Sinclair. [OEMsr-759.] Ohio State University. October 29, 1942.
- M2 The radiation patterns of a cone antenna on a B-17E at 250 mc. (Report No. 759-2.) George Sinclair. [OEMsr-759.] Ohio State University. November 22, 1942.
- M3 Patterns for a 50-ohm cone antenna mounted on a disc. (Report No. 759-6.) George Sinclair. [OEMsr-759.] [Ohio State University.] January 23, 1943.
- M4 Antenna patterns of a short, wide-band antenna, frequency range 200 [to] 550 mc. (Report No. 759-14.) Robert B. Jacques. [OEMsr-759.] Ohio State University. August 2, 1943.
- M5 C-11 antenna patterns for aircraft. George Sinclair, E. C. Jordan and others. NDCrc-100. Ohio State University. August 24, 1943.
- M6 Antenna radiation patterns for the Albatross I Project. (Report No. 759-20.) Ernest A. Jones and George Sinclair. OEMsr-759; Research Project No. RP-137. Ohio State University. February 25, 1944.
- M7 Antenna radiation patterns for the HS-293. (Report No. 759-23.) Ernest A. Jones. OEMsr-759; Research Project No. RP-137. Ohio State University. June 20, 1944.
- M8 Circular loop antennas at high frequencies. (Re-

port No. 895-31.) P. S. Carter. OEMsr-895; Research Project No. RP-260. Radio Corporation of America. January 10, 1945.

- M9** Summary of antenna radiation patterns for antennas on the P4M. (Report No. 759-27.) Ernest A. Jones and Paul H. Nelson. OEMsr-759; Project Nos. RP-137 and NA-199. Ohio State University. September 1, 1945.

- M10** A photographic plan position indicator method of model antenna pattern measurement. (Report No. 411-242.) John W. Christensen. OEMsr-411; Project Nos. RP-481 and AC-290.14. Harvard University, Radio Research Laboratory. September 10, 1945.

- M11** Summary of antenna radiation patterns for antennas on the PB4Y-2. (Report No. 759-26.) Ernest A. Jones and Paul H. Nelson. OEMsr-759; Project Nos. RP-137 and NA-221. Ohio State University. September 10, 1945.

- M12** Summary of antenna radiation patterns for Ferret C-1. (Report No. 759-28.) Ernest A. Jones and Paul H. Nelson. OEMsr-759; Project Nos. RP-137 and AC-259.06. Ohio State University. September 10, 1945.

- M13** Antenna radiation patterns for 1,000 mc measured on the SB2C. (Report No. 759-29.) Ernest A. Jones and Paul H. Nelson. OEMsr-759; Project Nos. RP-137 and NA-221. Ohio State University. September 13, 1945.

- M14** Measurement of shipborne antenna patterns using models. (Report No. 759-32.) Herman Heil, E. C. Jordan and David Cleckner. OEMsr-759; Project Nos. RP-427 and NS-398.04. Ohio State University. October 16, 1945.

333.22 Contributing Pattern Factors

- M1** Equivalent point antennas of constant current epoch. (Technical Memorandum No. 411-24.) Donald Foster. OEMsr-411; Research Project No. RP-107. Harvard University, Radio Research Laboratory. November 5, 1943.

- M2** Antennas and cylindrical fuselage. (Report No. 895-11.) P. S. Carter. OEMsr-895; Research Project No. RP-260. Radio Corporation of America. December 24, 1943.

- M3** Theory and applications of loop antennas. (Technical Memorandum No. 411-123.) Donald Foster. OEMsr-411; Research Project No. RP-107. Harvard University, Radio Research Laboratory. July 22, 1944.

- M4** An electromagnetic model of the ocean. (Report No. 867-10.) Edgar C. Hayden. OEMsr-867; Research Project No. RP-261-B. Columbia Broadcasting System, Inc. February, 1945.

333.3 Polarization Studies

- M1** Effects of the airplane structure on the polarization of airborne antennas. George Sinclair and E. C. Jordan. NDCrc-100. Ohio State University. November 17, 1943.

- M2** Antenna for horizontal polarization at ultra high frequencies. (Report No. 895-29.) R. S. Wehner. OEMsr-895; Research Project No. RP-352. Radio Corporation of America. October 19, 1944.

333.4 Power Limits of Trailing Wire Antenna

- M1** Power limit [for] airplane antennas. (Report No. 895-3.) P. S. Carter. OEMsr-895; Research Project No. RP-260. Radio Corporation of America. August 12, 1943.

- M2** Trailing wire antenna, Power limits [for] (Report No. 895-16.) P. S. Carter. OEMsr-895; Research Project No. RP-260. Radio Corporation of America. March 10, 1944.

333.5 Studies of Particular Antenna Types

333.51 Broad-Band

- M1** Broad-band lobe switching antenna. (Technical Memorandum No. 411-42.) Donald Foster. OEMsr-411; Research Project No. RP-107. Harvard University, Radio Research Laboratory. February 4, 1944.

- M2** Notes on synthesis of broad-band matching sections. (Report No. 895-15.) R. S. Wehner. OEMsr-895; Research Project No. RP-260. Radio Corporation of America. March 6, 1944.

- M3** Broad-band inverted-L antenna. (Report No. 895-24.) R. S. Wehner. OEMsr-895; Research Project No. RP-260. Radio Corporation of America. July 20, 1944.

- M4** Design charts for synthesis of two-element broad-band matching sections. (Report No. 895-33.) R. S. Wehner. OEMsr-895; Research Project No. RP-260. Radio Corporation of America. January 2, 1945.

333.52 Long-Wave

- M1** Measurements on a 1200-ft long-wave antenna over Rocky Point soil. (Report No. 895-21.) N. E. Lindenblad. OEMsr-895; Research Project No. RP-260. Radio Corporation of America. May 2, 1944.

- M2** Measurements on 1200-ft long-wave antennas over Tobyhanna, Pennsylvania, soil. (Report No. 895-23.) W. A. Miller. OEMsr-895; Research Project No. RP-260. Radio Corporation of America. June 20, 1944.

- M3** Measurements on 1200-ft, 2250-ft and 3600-ft long-wave antennas over sandy New Jersey plains soil. (Report No. 895-27.) R. E. Franklin. OEMsr-895; Research Project No. RP-260. Radio Corporation of America. August 28, 1944.

333.53 Slot

- M1** A flush surface antenna of the slot-cavity type having wide-band characteristics. (Report No. 895-32.) N. E. Lindenblad. OEMsr-895; Research Project No. RP-260. Radio Corporation of America. March 26, 1945.

- M2** Modeling slot antennas. (Report No. 759-31.) D. R. Rhodes, E. C. Jordan and Paul H. Nelson. OEMsr-759; Research Project No. RP-137. Ohio State University. October 3, 1945.
- M3** Slot antenna development at Radio Research Laboratory. (Report No. 411-263.) David Lazarus. OEMsr-411; Project Nos. RP-303, AC-294.17 and others. Harvard University, Radio Research Laboratory. November 17, 1945.
- 333.54 Miscellaneous Antenna Types**
- M1** Stub antennas with series matching sections. (Report No. 867-7.) Robert Serrell. OEMsr-867; Research Project No. RP-261. Columbia Broadcasting System, Inc. April, 1944.
- M2** Semi-empirical relations between the gain, aperture, beam width and shape of high-gain antennas. (Report No. 411-119.) Andrew Alford and I. G. Clarke. OEMsr-411. Harvard University, Radio Research Laboratory. October 19, 1944.
- 340 Tubes**
- 341 Magnetrons**
- M1** [The] Radio Research Laboratory magnetron program as of December 1, 1943. (Technical Memorandum No. 411-60.) W. G. Dow. OEMsr-411. Harvard University, Radio Research Laboratory. February 2, 1944.
- M2** Low-power tunable oscillators. (Final Report No. 1456-1.) H. J. McCarthy. OEMsr-1456; Project Nos. AC-294.23, RP-4306 and others. Sylvania Electric Products, Inc. May 1, 1946.
- 341.1 25—100 Watt Level**
- M1** Recent progress in the study of tunable squirrel-cage magnetrons. (Report No. 411-184.) F. H. Crawford. OEMsr-411; Research Project No. RP-295. Harvard University, Radio Research Laboratory. May 10, 1945.
- M2** A tunable squirrel-cage magnetron, the donutron. (Report No. 411-252.) F. H. Crawford and M. D. Hare. OEMsr-411; Research Project No. RP-295. Harvard University, Radio Research Laboratory. October 1, 1945.
- M3** The construction of the donutron, a tunable squirrel-cage magnetron. (Report No. 411-249.) M. D. Hare and Virginia Leonard. OEMsr-411; Research Project No. RP-295. Harvard University, Radio Research Laboratory. October 26, 1945.
- M4** The ZP-633, a 25-watt magnetron for the 300 to 1500-megacycle range. (Report No. 931-24.) R. D. Gordon. OEMsr-931; Project Nos. RP-430a, SC-94.23 and AC-294.23. General Electric Company. November 21, 1945.
- M5** The ZP-652 10-cm tunable magnetron. (Report No. 931-35.) R. B. Nelson. OEMsr-931; Project Nos. RP-430a and SC-94.23. General Electric Company. November 23, 1945.
- 341.2 150 Watt Level (Flute Series)**
- M1** The ZP-579, a 150-watt magnetron for the 350 to 750-megacycle range. (Report No. 931-6.) John P. Blewett. OEMsr-931; Research Project No. RP-244. General Electric Company. February 14, 1944.
- M2** Noise modulation of ZP-597 magnetron at 150-watt output level. (Technical Memorandum No. 411-138.) F. H. Crawford. OEMsr-411; Research Project No. RP-295. Harvard University, Radio Research Laboratory. August 1, 1944.
- M3** Decay of efficiency in the 5-J29 magnetron. (Report No. 931-22.) T. R. Holer. OEMsr-931; Project Nos. SC-94.12, NS-208 and RP-244. General Electric Company. October 22, 1945.
- 341.3 200—300 Watt Level**
- M1** Noise modulation of the ZP-612-6-3 magnetron at power levels near 300 watts. (Report No. 411-130.) F. H. Crawford. OEMsr-411; Research Project No. RP-417. Harvard University, Radio Research Laboratory. December 6, 1944.
- M2** The A-131, a tunable X-band continuous-wave magnetron. (Report No. 1043-6.) L. Malter, R. L. Jepsen and others. OEMsr-1043; Project Nos. RP-244-B, NA-156 and NS-394.01. Radio Corporation of America. November 15, 1945.
- 341.4 1 Kilowatt Level (Piccolo Series)**
- M1** Noise modulation of the ZP-594 at 1-kw output power. (Technical Memorandum No. 411-138A.) F. H. Crawford. OEMsr-411; Research Project No. RP-295. Harvard University, Radio Research Laboratory. October 2, 1944.
- M2** Some considerations governing design of electromagnets for Piccolo series of multianode magnetrons. (Report No. 1019-1.) Lewi Tonks. OEMsr-1019; Project Nos. RP-158A and NS-394.02. General Electric Company. June 6, 1945.
- M3** Parasitic resonance studies on the ZP-597 magnetron. (Report No. 1019-4.) A. H. Sharbaugh. OEMsr-1019; Project Nos. SC-94.25, NS-394.02 and RP-158-A. General Electric Company. September 18, 1945.
- M4** Development of the ZP-616 magnetron. (Report No. 1019-2.) H. C. Hertha, R. B. Nelson and T. C. Swartz. OEMsr-1019; Project Nos. SC-94.25, NS-394.02 and RP-158A. General Electric Company. September 27, 1945.
- M5** Development of two 1-kw continuous-wave tunable magnetrons. (Report No. 1430-1.) A. K. Wing, Jr., A. S. Vanderhoof and others. OEMsr-1430; Project Nos. RP-158C, SC-94.25 and others. Federal Telephone and Radio Corporation. September 29, 1945.
- M6** Development of 1000-watt tunable magnetron for S-band. (Report No. 1357-1.) W. G. Wagener. OEMsr-1357; Project Nos. RP-158b, SC-94.25 and others. Litton Engineering Laboratories. September 30, 1945.

- M7** Preproduction experience with 100- to 1000-watt continuous-wave magnetrons for the 90- to 1500-megacycle range. (Report No. 931-31.) M. C. Schramm. OEMsr-931; Research Project Nos. RP-158f and RP-244. General Electric Company. October 18, 1945.
- M8** [The] L-104, X-band Piccolo. (Report No. 1019-6.) R. A. Dehn, W. H. Teare and S. E. Webber. OEMsr-1019; Project Nos. RP-158a, NA-156 and NS-394.02. General Electric Company. October 25, 1945.
- M9** Modulation tests of the 6-J21 magnetron. (Report No. 411-235.) J. C. Turnbull, J. R. Duggan and others. OEMsr-411; Project Nos. SC-94.25, RP-417 and others. Harvard University, Radio Research Laboratory. October 29, 1945.
- M10** General report on Piccolo Project: 1-kw tunable continuous-wave magnetrons. (Report No. 1019-5.) Lewi Tonks, J. S. Burgess and others. OEMsr-1019; Project Nos. RP-158A, SC-94.25 and NS-394.02. General Electric Company. October 29, 1945.
- M11** Development of ZP-594 multivane magnetron. (Report No. 1019-7.) R. I. Reed. OEMsr-1019; Project Nos. RP-158A, SC-94.25 and NS-394.02. General Electric Company. October 29, 1945.
- M12** History of the development of the ZP-597 multivane magnetron. (Report No. 1019-8.) Paul W. Crapuchettes, R. I. Reed and R. J. Stupp. OEMsr-1019; Project Nos. RP-158A, SC-94.25 and NS-394.02. General Electric Company. October 29, 1945.
- M13** The A-132 and A-133 tunable continuous-wave magnetrons. (Report No. 1043-7.) R. B. Vandegrift. Project Nos. SC-94.25, RP-158-D and others. Radio Corporation of America. November 15, 1945.
- M14** The ZP-636 externally-tuned high-power magnetron. (Report No. 931-30.) R. B. Nelson. OEMsr-931; Project Nos. RP-116 and NS-278. General Electric Company. November 21, 1945.
- M15** [The] 100- to 1000-watt continuous-wave magnetrons for the 90- to 1500-mc range. (Report No. 931-23.) D. A. Wilbur, R. V. Langmuir and R. D. Gordon. OEMsr-931; Project Nos. RP-244, NS-208 and others. General Electric Company. November 23, 1945.

341.5 10—Kilowatt Level

- M1** The ZP-595 magnetron. (Report No. 931-7.) R. B. Nelson, R. V. Langmuir and John P. Blewett. OEMsr-931; Research Project No. RP-116. General Electric Company. February 9, 1944.
- M2** Preliminary test results on Westinghouse 10-kw magnetron. (Report No. 411-70.) Gunnar Hok. OEMsr-411; Research Project No. RP-321. Harvard University, Radio Research Laboratory. August 18, 1944.
- M3** Development of high-power tubes at Westinghouse. Volume II, Development of 10-kw magne-

trons. (Report No. 747-3.) F. W. Boggs. OEMsr-747; Project Nos. RP-351a, SC-94.24 and NS-394.03. Westinghouse Electric Corporation. July 5, 1945.

- M4** The ZP-595, a 10-kw magnetron oscillator at 500 mc. (Report No. 931-33.) R. V. Langmuir and R. B. Nelson. OEMsr-931; Project Nos. RP-116, SC-94.24 and NS-394.03. General Electric Company. November 19, 1945.

- M5** Further developments concerning the Westinghouse 10-kw magnetron. (Summary Report No. 411-70A.) Gunnar Hok and M. B. Gottlieb. OEMsr-411; Project Nos. RP-321, SC-94.19 and others. Harvard University, Radio Research Laboratory. January 11, 1946.

341.6 Miscellaneous Magnetron Studies

- M1** Magnetron modulation by means of a rotating electron cloud. (Report No. 411-185.) F. Crawford and M. Pease. OEMsr-411; Project Nos. RP-417, SC-94.25 and NS-278. Harvard University, Radio Research Laboratory. November 15, 1944.
- M2** Mica windows for wave guide output magnetrons. (Division 14. Report No. 366.) L. Malter, R. L. Jepsen and L. R. Bloom. OEMsr-1043. Radio Corporation of America. December 5, 1944.
- M3** Wave guide output magnetrons employing fused quartz output transformers. (Division 14. Report No. 367.) L. Malter and J. L. Moll. OEMsr-1043. Radio Corporation of America. January 15, 1945.
- M4** Technical report on K-band magnetron. (Division 14. Report No. 444.) L. Malter, J. A. Beard and others. OEMsr-1043. Radio Corporation of America. March 1, 1945.
- M5** An extension of Clogsten's scaling formulas to include change of number of slots. (Report No. 1043-5.) Han Chuan Hu. OEMsr-1043; Project Nos. RP-430c, SC-94.23 and others. Radio Corporation of America. May 15, 1945.
- M6** Space-charge-limited single-stream solutions in a cylindrical magnetron with small current. (Report No. 411-175.) Felix Bloch. OEMsr-411; Research Project No. RP-295. Harvard University, Radio Research Laboratory. May 25, 1945.
- M7** Self-regulating field excitation for continuous-wave magnetrons. (Report No. 411-284.) H. C. Early and H. W. Welch. OEMsr-411; Project Nos. RP-461, SC-94.25 and NS-394.10. Harvard University, Radio Research Laboratory. October 31, 1945.
- M8** A magnetron filament regulator. (Report No. 931-21.) P. H. Peters, Jr. OEMsr-931; Project Nos. RP-244 and NS-218. General Electric Company. November 16, 1945.

342 Resnatrons

- M1** Resnatron report. (Report No. 747-1.) (n.a.) OEMsr-747. [Bell Telephone Laboratories, Inc. (?)]. March 1, 1943.
- M2** Development of resnatrons for high-power continuous-wave ground jammer. (Report No. 747-2.) W. B. Fretter and F. W. Boggs. OEMsr-747;

Project Nos. RP-351a, SC-94.24 and NS-394.03. Westinghouse Electric Corporation. September 21, 1944.

M3 Test information on resnatron, Types X-124 and X-139. (Report No. 411-126.) W. R. Rambo, L. D. Tuck and S. W. Howe. OEMsr-411; Research Project No. RP-378. Harvard University, Radio Research Laboratory. November 16, 1944.

M4 Development of a sealed-off resnatron. (Report No. 1034-1.) E. Labin, M. Ardit and others. OEMsr-1034; Research Project No. RP-247. Federal Telephone and Radio Corporation. May 31, 1945.

343 Noise Output of Tubes

343.1 RCA 931 Photoelectric Tubes

M1 A high-level noise generator. (Report No. 1.) John N. Dyer. Harvard University, Radio Research Laboratory. July 8, 1942.

M2 Calculated frequency spectrum of RCA 931 noise source. (Report No. 26.) R. D. Sard. Harvard University, Radio Research Laboratory. April 16, 1943.

M3 Operating characteristics of the [RCA] 931 phototube in the frequency range 50 to 5000 kc. (Report No. 411-57.) J. D. Cobine and C. J. Gallagher. Harvard University, Radio Research Laboratory. August 31, 1943.

M4 Noise conference at Radio Research Laboratory. (n.a.) Harvard University, Radio Research Laboratory. October 19, 1943.

M5 A grid-controlled photomultiplier and its application to regeneratively increasing noise output. (Report No. 1060-1.) Alan M. Glover, Ralph W. Engstrom and W. J. Pietenpol. OEMsr-1060; Research Project No. RP-196. Radio Corporation of America. May 16, 1944.

M6 Life tests on RCA 931-A phototubes. (Technical Memorandum No. 411-119.) C. J. Gallagher. OEMsr-411; Research Project No. RP-187. Harvard University, Radio Research Laboratory. May 31, 1944.

M7 The investigation and manufacture of noise sources at Radio Corporation of America. (Final Report No. 1060-2.) Alan M. Glover, Ralph W. Engstrom and W. J. Pietenpol. OEMsr-1060; Research Project No. RP-196. Radio Corporation of America. March 7, 1945.

343.2 Gas Tubes

M1 Noise in gas tubes. (Report No. 411-68.) J. D. Cobine and C. J. Gallagher. OEMsr-411; Research Project No. RP-186. Harvard University, Radio Research Laboratory. January 24, 1944.

343.21 Noise Generators

M1 Voice frequency noise generator. (Preliminary Report No. 8.) M. E. Campbell. Research Project No. C-63. Bell Telephone Laboratories, Inc. January 30, 1943.

M2 Audio frequency noise generators. (Preliminary Report No. 4.) H. H. Benning. OEMsr-966. Bell Telephone Laboratories, Inc. May 26, 1943.

M3 Constriction oscillator. (Report No. 931-5.) Lewis R. Koller. OEMsr-931; Research Project No. RP-243. General Electric Company. November 20, 1943.

M4 Gas tube noise generator development. (Report No. 1024-2.) Ronald H. Culver. OEMsr-1024; Research Project No. RP-189. Jansky and Bailey. January, 1944.

M5 Cold-cathode gas tube noise generators. (Report No. 411-239.) Stanley Ruthberg. OEMsr-411; Project Nos. RP-187 and SC-94.16. Harvard University, Radio Research Laboratory. September 13, 1945.

343.22 Hot-Cathode Arcs

M1 Tungar rectifier bulbs as noise generators. (Report No. 1176-1.) Stuart Ballantine. OEMsr-1176; Research Project No. RP-311. Ballantine Laboratories. February 11, 1944.

M2 Oscillations and noise in hot-cathode arcs. (Report No. 411-232.) J. D. Cobine, C. J. Gallagher and others. OEMsr-411; Project Nos. RP-187, RP-181 and SC-94.16. Harvard University, Radio Research Laboratory. September 26, 1945.

343.23 Thyatron

M1 Noise output of the FG-178A thyatron in the range 100 kc to 9 mc. (Technical Memorandum No. 411-3.) J. D. Cobine. OEMsr-411; Research Project No. RP-187. Harvard University, Radio Research Laboratory. December 10, 1943.

M2 Noise output of the GL-546. (Technical Memorandum No. 411-121.) C. J. Gallagher. OEMsr-411; Research Project No. RP-187. Harvard University, Radio Research Laboratory. June 5, 1944.

343.24 Gas Tube Models

343.241 Sylvania 6D-4 and 2C-4

M1 Noise generated by the Sylvania 2C-4 and 6D-4 miniature gas triodes in the frequency range 100 kc to 5 mc. (Technical Memorandum No. 411-38.) J. D. Cobine. OEMsr-411; Research Project No. RP-187. Harvard University, Radio Research Laboratory. February 8, 1944.

M2 Noise generated by the Sylvania 2C-4 and 6D-4 miniature gas triodes in the frequency range 100 kc to 9 mc. (Technical Memorandum No. 411-38A.) J. D. Cobine. OEMsr-411; Research Project No. RP-187. Harvard University, Radio Research Laboratory. March 21, 1944.

M3 Low-frequency noise spectrum of the 6D-4 gas triode. (Technical Memorandum No. 411-115.) J. D. Cobine. OEMsr-411; Research Project No. RP-187. Harvard University, Radio Research Laboratory. May 15, 1944.

M4 Noise output of the Sylvania 6D-4 gas triode at

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audio and supersonic frequencies, 25 cps to 100 kc. (Report No. 411-92.) J. D. Cobine. OEMsr-411; Research Project No. RP-187. Harvard University, Radio Research Laboratory. May 29, 1944.

- M5** One-sided clipping of the 6D-4 spectrum. (Technical Memorandum No. 411-69.) P. S. Jastram. OEMsr-411; Research Project No. RP-187. Harvard University, Radio Research Laboratory. July 27, 1944.

- M6** Magnets for the 6D-4 noise tube. (Report No. 411-74.) J. D. Cobine. OEMsr-411; Research Project No. RP-187. Harvard University, Radio Research Laboratory. August 31, 1944.

- M7** Audio and supersonic noise generators. (Report No. 411-76.) J. D. Cobine. OEMsr-411; Research Project No. RP-187. Harvard University, Radio Research Laboratory. August 31, 1944.

- M8** A theoretical study of the response of saturated linear and quadratic rectifiers to random noise. Calculations for the 6D-4 noise source. (Report No. 411-97.) David Middleton, Joan H. Seaman and Eleanor Pressly. OEMsr-411; Research Project No. RP-181. Harvard University, Radio Research Laboratory. October 23, 1944.

- M9** A new noise source design. (Report No. 931-14.) P. H. Peters, Jr. OEMsr-931; Research Project No. RP-393. General Electric Company. December 20, 1944.

- M10** The characteristics of the Sylvania 6D-4 miniature gas triode as a noise source for the range 0.1 to 5 mc. (Report No. 411-169.) J. D. Cobine and J. R. Curry. OEMsr-411; Research Project No. RP-187. Harvard University, Radio Research Laboratory. March 30, 1945.

- M11** The 6D-4 spectrum checker. (Report No. 411-258.) P. S. Jastram and C. J. Gallagher. OEMsr-411; Project Nos. RP-187 and SC-94.16. Harvard University, Radio Research Laboratory. September 28, 1945.

343.242 RCA 884

- M1** The RCA 884 gas triode as a noise source. (Technical Memorandum No. 1.) J. D. Cobine. Harvard University, Radio Research Laboratory. September 22, 1943.

- M2** Noise output of RCA 884 gas triode at high frequencies. (Report No. 940-9.) A. E. Kerwien. OEMsr-940; Research Project No. RP-199. Bell Telephone Laboratories, Inc. November 3, 1943.

- M3** The jamming effectiveness of a gas tube noise source exhibiting oscillations. (Technical Memorandum No. 411-31.) D. A. Peterson. OEMsr-411; Research Project No. RP-186. Harvard University, Radio Research Laboratory. November 22, 1943.

- M4** Low-frequency noise spectrum of the RCA 884 gas triode. (Technical Memorandum No. 411-116.) J. D. Cobine, C. J. Gallagher and P. S. Jastram. OEMsr-411; Research Project No. RP-187. Har-

vard University, Radio Research Laboratory. May 15, 1944.

- M5** Use of transformer coupling with gas tube noise sources. (Report No. 1176-2.) Stuart Ballantine and Edmund Osterland. OEMsr-1176; Research Project No. RP-311. Ballantine Laboratories. June 1, 1944.

- M6** Audio and supersonic noise characteristics of the RCA 884 and 2050 gas tubes, 25 cps to 100 kc. (Report No. 411-136.) J. D. Cobine, C. J. Gallagher P. S. Jastram. OEMsr-411; Research Project No. RP-187. Harvard University, Radio Research Laboratory. December 12, 1944.

343.243 Miscellaneous Gas Tube Models

- M1** Noise output of RCA 2D-21 miniature gas tetrode, in the range 100 kc to 9 mc. (Technical Memorandum No. 411-36.) J. D. Cobine. OEMsr-411; Research Project No. RP-186. Harvard University, Radio Research Laboratory. January 11, 1944.

- M2** A calculation of the effect of rectification and clipping on the spectra of the output of the RCA 6D-4, 884, 178-A and 2D-21 noise sources. (Report No. 411-90.) David Middleton. OEMsr-411; Research Project No. RP-181. Harvard University, Radio Research Laboratory. June 23, 1944.

- M3** Noise source investigations at Ballantine Laboratories. (Report No. 1176-3.) Compiled by: Edmund Osterland. OEMsr-1176; Research Project No. RP-311. Ballantine Laboratories. August 1, 1944.

344 Cathode-Ray Tubes

- M1** A tantalum cylinder cathode for continuous-wave magnetrons. (Report No. 1043-2.) R. L. Jepsen. OEMsr-1043; Project Nos. RP-430c, SC-94.23, NS-394.01 and others. Radio Corporation of America. January 15, 1945.

- M2** Cathode-ray phototube demodulation of time division multiplex pulse signal. (Report No. 895-42.) Bertram A. Trevor. OEMsr-895; Project Nos. RP-460 and SC-93.02. Radio Corporation of America. October 17, 1945.

344.1 Screen Patterns

- M1** Techniques for still and cine photography of cathode-ray tube screen patterns. (Report No. 39.) E. R. Brill, C. Gray and others. Harvard University, Radio Research Laboratory. May 6, 1943.

345 Reactance Tubes

- M1** Notes on a common grid reactance tube circuit. (Technical Memorandum No. 411-40.) W. R. Rambo. OEMsr-411; Research Project No. RP-203. Harvard University, Radio Research Laboratory. January 15, 1944.

- M2** Class C operation of reactance tubes. (Report No. 411-82) W. R. Rambo. OEMsr-411; Research

Project No. RP-203. Harvard University, Radio Research Laboratory. February 4, 1944.

- M3** A common grid reactance tube circuit at ultra high frequencies. (Technical Memorandum No. 411-40A.) J. W. Kearney and W. R. Rambo. OEMsr-411; Research Project No. RP-203. Harvard University, Radio Research Laboratory. April 15, 1944.
- M4** Notes on factors affecting the selection of values for use in the phase net of reactance tubes. (Report No. 1138-2.) Joseph I. Heller and Oscar Friedman. OEMsr-1138; Research Project No. RP-307. Panoramic Radio Corporation. October 23, 1944.

346 Miscellaneous Tubes and Tube Problems

- M1** Ultra high frequency diode. (Report No. 867-3.) Martin M. Freundlich. OEMsr-867. Columbia Broadcasting System, Inc. December 21, 1943.
- M2** A gold-copper alloy solder. (Report No. 931-13.) R. B. Nelson. OEMsr-931; Research Project No. RP-116. General Electric Company. May 30, 1944.
- M3** Amplification characteristics of the L-14 with small signal input at 3000 mc. (Report No. 931-12.) N. T. Lavoo. OEMsr-931; Research Project No. RP-396. General Electric Company. August 25, 1944.
- M4** The L-200, a 5-kw triode for the 70- to 350-mc range. (Report No. 931-28.) A. M. Gurewitsch, J. S. Hickey and others. OEMsr-931; Project Nos. RP-394 and NA-102. General Electric Company. November 8, 1945.
- M5** Tracing of electron trajectories using the differential analyzer. (Report No. 931-29.) John P. Blewett, Gabriel Kron and others. OEMsr-931; Research Project Nos. RP-244 and RP-430a. General Electric Company. November 23, 1945.

350 Oscillators

351 Coaxial Cavity

351.1 Microwave

- M1** A wide-range microwave oscillator, A-1501. (Report No. 11.) George E. Hulstede. Harvard University, Radio Research Laboratory. January 7, 1943.
- M2** Survey of microwave power oscillators. (Technical Memorandum No. 411-135.) F. A. Record. OEMsr-411; Research Project No. RP-295. Harvard University, Radio Research Laboratory. August 14, 1944.
- M3** McNally tubes in radial cavities. (Report No. 411-241.) J. J. Wedel. OEMsr-411; Research Project No. RP-286. Harvard University, Radio Research Laboratory. September 11, 1945.
- M4** The electrical characteristics of the D-9081 and Q-1248 X-band oscillator. (Report No. 411-268.) Howard Zeidler. OEMsr-411; Project Nos. RP-

286, AC-290.12 and others. Harvard University, Radio Research Laboratory. December 14, 1945.

351.2 Ultra High Frequency

- M1** Continuous-wave oscillators using the experimental General Electric L-3 triode in coaxial line circuits. (Report No. 38.) J. Gregg Stephenson. Harvard University, Radio Research Laboratory. May 3, 1943.
- M2** Continuous-wave oscillations using the General Electric ZP-449 triode in coaxial line circuits. (Report No. 49.) J. Gregg Stephenson and R. L. Henkel. Harvard University, Radio Research Laboratory. July 12, 1943.
- M3** Operation of RCA A-2212 (Nehrgaard tube) in a coaxial cavity oscillator. (Technical Memorandum No. 411-66.) R. L. Henkel. OEMsr-411. Harvard University, Radio Research Laboratory. February 4, 1944.
- M4** The General Electric ZP-522 triode as a continuous-wave oscillator and amplifier in coaxial line circuits. (Report No. 411-83.) J. Gregg Stephenson and R. L. Henkel. OEMsr-411; Research Project No. RP-204. Harvard University, Radio Research Laboratory. March 15, 1944.
- M5** Random pulsed triode cavity oscillators and jammers. (Technical Memorandum No. 411-101.) Robert R. Buss. OEMsr-411; Research Project No. RP-186. Harvard University, Radio Research Laboratory. April 20, 1944.
- M6** A triode oscillator tripler. (Report No. 411-116.) W. R. Rambo and L. D. Tuck. OEMsr-411; Research Project No. RP-169. Harvard University, Radio Research Laboratory. October 20, 1944.
- M7** A 60- to 300-mc power oscillator with single-dial tuning control. (Report No. 411-295.) J. Gregg Stephenson and Milton B. Adams. OEMsr-411; Research Project No. RP-346. Harvard University, Radio Research Laboratory. December 14, 1945.

352 Low-Power

- M1** A 3- to 6-cm low-power oscillator. (Technical Memorandum No. 411-139.) Ralph H. Hoglund. OEMsr-411; Research Project No. RP-286. Harvard University, Radio Research Laboratory. August 22, 1944.
- M2** The development of low-power continuously-tuned oscillators operating in the X- and S-bands. The 2K-48 and 2K-49 vacuum tubes. (Report No. 1222-1.) A. L. Samuel and J. W. Clark. OEMsr-1222; Research Project No. RP-332. Western Electric Company, Inc. February 28, 1945.
- M3** The development of low-power continuously-tuned oscillators operating in the X- and S-bands. The 2K-48 and 2K-49 vacuum tubes. (Final Report No. 1222-2.) A. L. Samuel. OEMsr-1222; Project Nos. RP-439, NS-394.01 and NA-156. Western Electric Company, Inc. September 28, 1945.

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353 Modulated

- M1** Notes on oscillators in connection with electronic tuning for panoramic reception. (Report No. 1138-1.) Joseph I. Heller. OEMsr-1138; Research Project No. RP-307. Panoramic Radio Corporation. March 8, 1944.
- M2** Notes on the wide-band modulation of coaxial line oscillators using lighthouse triodes. (Technical Memorandum No. 411-65.) R. R. Webster and J. Gregg Stephenson. OEMsr-411; Research Project No. RP-305. Harvard University, Radio Research Laboratory. March 10, 1944.
- M3** Electronic tuning for panoramic reception. (Report No. 1138-3.) Joseph I. Heller. OEMsr-1138; Research Project No. RP-307. Panoramic Radio Corporation. December 1, 1944.

360 Filters

- M1** Filter mismatch loss with improper termination. (Report No. 411-201.) Seymour B. Cohn and Paul I. Richards. OEMsr-411; Project Nos. RP-442 and SC-90.12. Harvard University, Radio Research Laboratory. June 12, 1945.
- M2** The universal characteristics of triple-resonant circuit band-pass filters. (Report No. 411-240.) Karl R. Spangenberg. OEMsr-411; Project Nos. RP-442, AC-290.12 and AC-290.16. Harvard University, Radio Research Laboratory. September 25, 1945.

361 Coaxial (Distributed Constants)

- M1** Design information for several ultra high frequency filters. (Report No. 28.) Seymour B. Cohn. Harvard University, Radio Research Laboratory. April 9, 1943.
- M2** Resonant section coaxial filters. (Report No. 411-115.) Paul I. Richards. OEMsr-411; Research Project No. RP-286. Harvard University, Radio Research Laboratory. October 18, 1944.
- M3** Supplementary information on resonant section coaxial filters. (Report No. 411-115D.) Paul I. Richards. OEMsr-411; Project Nos. RP-442, AC-290.12 and AC-290.16. Harvard University, Radio Research Laboratory. July 16, 1945.
- M4** Résumé of ultra high frequency filter development. (Report No. 411-234.) Seymour B. Cohn and Paul I. Richards. OEMsr-411; Project Nos. RP-442, AC-290.12 and AC-290.16. Harvard University, Radio Research Laboratory. September 10, 1945.

361.1 Low-Pass

- M1** The R-807 low-pass filter. (Technical Memorandum No. 411-64.) Seymour B. Cohn. OEMsr-411; Research Project No. RP-287. Harvard University, Radio Research Laboratory. March 17, 1944.
- M2** Spurious responses in a transmission line low-pass filter. (Report No. 411-115b.) Paul I. Richards.

OEMsr-411; Research Project No. RP-442. Harvard University, Radio Research Laboratory. March 15, 1945.

- M3** Design of microwave low-pass filters. (Report No. 411-163.) Seymour B. Cohn. OEMsr-411; Project Nos. RP-442 and SC-90.12. Harvard University, Radio Research Laboratory. June 1, 1945.

361.2 High-Pass

- M1** The M-4601 and M-4602 high-pass filters. (Report No. 411-113.) Peter L. Harbury. OEMsr-411; Research Project No. RP-286. Harvard University, Radio Research Laboratory. November 5, 1944.
- M2** An easily constructed high-pass coaxial filter. (Report No. 411-115A.) Paul I. Richards. OEMsr-411; Research Project No. RP-442. Harvard University, Radio Research Laboratory. March 9, 1945.
- M3** A variable cut-off high-pass filter for use with AN/APR-5A. (Report No. 411-161.) Walter G. Wadey. OEMsr-411; Research Project No. RP-107. Harvard University, Radio Research Laboratory. March 14, 1945.

362 Lumped Constants

- M1** The M-125 75-megacycle low-pass filter. (Technical Memorandum No. 411-102.) J. G. C. Swinney, Jr. OEMsr-411; Research Project No. RP-306. Harvard University, Radio Research Laboratory. April 24, 1944.

370 Transmission Lines and Components**371 Transmission Lines**

- M1** Losses in various transmission lines at several frequencies. (Technical Memorandum No. 411-17.) L. T. Slocum. OEMsr-411. Harvard University, Radio Research Laboratory. August 16, 1943.
- M2** Determination of relative power on a concentric transmission line. (Technical Memorandum No. 411-118.) C. Milton Daniell. OEMsr-411; Research Project No. RP-306. Harvard University, Radio Research Laboratory. June 13, 1944.
- M3** A note on three theoretical expressions for the characteristic impedance of a shielded balanced line. (Technical Memorandum No. 411-130.) Peter J. Sutro. OEMsr-411; Research Project No. RP-107. Harvard University, Radio Research Laboratory. July 7, 1944.
- M4** Frequency bands of loaded and unloaded resonant sections of line. (Technical Memorandum No. 411-85.) Peter J. Sutro. OEMsr-411; Research Project No. RP-107. Harvard University, Radio Research Laboratory. July 26, 1944.

371.1 Wave Guides

- M1** A rapid fastener for wave guides. (Technical Memorandum No. 411-88.) Walter G. Wadey. OEMsr-411; Research Project No. RP-286. Harvard Uni-

versity, Radio Research Laboratory. July 22, 1944.

- M2** Wide-band wave guide mixers. (Report No. 411-79.) Ralph H. Hoglund, A. J. Yakutis and J. S. Foster, Jr. OEMsr-411; Research Project No. RP-286. Harvard University, Radio Research Laboratory. October 16, 1944.
- M3** Resonant probe in wave guide. (Report No. 411-137.) Thomas E. Moore and Walter G. Wadey. OEMsr-411; Research Project No. RP-107. Harvard University, Radio Research Laboratory. December 26, 1944.
- M4** Sensitivity of the AN/APR-5A in wave guide, 3 to 10 cm. (Report No. 411-138.) Thomas E. Moore and Walter G. Wadey. OEMsr-411; Research Project No. RP-107. Harvard University, Radio Research Laboratory. December 26, 1944.
- M5** Moisture in wave guides. (Report No. 411-147.) Thomas E. Moore and Walter G. Wadey. OEMsr-411; Research Project No. RP-107. Harvard University, Radio Research Laboratory. January 6, 1945.
- M6** Wave guide installation for AN/APR-5A. (Report No. 411-149.) Thomas E. Moore and Walter G. Wadey. OEMsr-411; Research Project No. RP-107. Harvard University, Radio Research Laboratory. January 8, 1945.
- M7** Design of simple broad-band wave guide-to-coax junctions. (Report No. 411-186.) Seymour B. Cohn. OEMsr-411; Project Nos. RP-442b, AC-290.16 and AC-290.12. Harvard University, Radio Research Laboratory. July 18, 1945.
- M8** A broad-band directional pickup and wattmeter for wave guide. (Report No. 411-221.) H. C. Early. OEMsr-411; Project Nos. RP-461a and NS-394.10. Harvard University, Radio Research Laboratory. August 1, 1945.
- M9** Properties of ridge wave guide. (Report No. 411-211.) Seymour B. Cohn. OEMsr-411; Project Nos. RP-442, AC-290.12 and AC-290.16. Harvard University, Radio Research Laboratory. August 15, 1945.
- M10** Attenuation in wave guide at 3000 mc due to moisture condensation. (Report No. 411-253.) Paul A. Pearson. OEMsr-411; Research Project No. RP-481. Harvard University, Radio Research Laboratory. October 2, 1945.
- M11** An all-metal dummy load for wave guide. (Report No. 411-229.) H. C. Early. OEMsr-411; Project Nos. RP-461 and NS-394.10. Harvard University, Radio Research Laboratory. October 25, 1945.

371.2 Coaxial

- M1** Notes on the velocity of radio waves in a coaxial line. (Technical Memorandum No. 411-30.) W. W. Salisbury. OEMsr-411. Harvard University, Radio Research Laboratory. August 15, 1944.
- M2** Measurements on wide-band coaxial lines. (Report No. 411-255.) J. C. Turnbull, J. R. Duggan and R. W. Green. OEMsr-411; Project Nos. RP-

405 and SC-94.25. Harvard University, Radio Research Laboratory. September 26, 1945.

371.3 Cables and Connectors

- M1** Attenuation of RG-21/AU cable as a function of frequency. (Report No. 411-123.) Walter G. Wadey and Thomas E. Moore. OEMsr-411; Research Project No. RP-107. Harvard University, Radio Research Laboratory. November 13, 1944.
- M2** Radio frequency conductors and fittings. (Report No. 411-237.) J. G. C. Swinney, Jr. OEMsr-411; Research Project No. RP-472. Harvard University, Radio Research Laboratory. September 11, 1945.

372 Accessories

372.1 Switches

- M1** Preliminary instructions for the M-2404 (SA-14/SPR-1) and M-2413 (SA-44/APR) radio frequency switches. (Instruction Book, No. 411-IB-44.) John H. Jasberg and E. L. Bock. OEMsr-411; Research Project No. RP-138. Harvard University, Radio Research Laboratory. January 11, 1945.
- M2** Preliminary instructions for the M-2415 switch (SW-44A/APR). (Instruction Book, No. 411-IB-41.) John H. Jasberg and E. L. Bock. OEMsr-411; Research Project No. RP-138. Harvard University, Radio Research Laboratory. February 1, 1945.
- M3** Antenna switching unit, CLU-24314. (Report No. 1305-10.) Norman E. Klein. OEMsr-1305; Project Nos. RP-402a, NS-310 and others. Airborne Instruments Laboratory, Inc. April 17, 1945.
- M4** Antenna transfer switch. (Report No. 1305-19.) Norman E. Klein and Lyman C. Ihrig. OEMsr-1305; Project Nos. RP-402b and NS-395.08. Airborne Instruments Laboratory, Inc. August 31, 1945.

372.2 Oscillators

- M1** Theory of mode separation in a coaxial oscillator. (Technical Memorandum No. 411-132.) Peter J. Sutro. OEMsr-411; Research Project No. RP-107. Harvard University, Radio Research Laboratory. July 25, 1944.

380 Circuits

381 Circuit Elements

381.1 Transformers

- M1** Transformers and chokes for power supplies. (Report No. 21.) John P. Woods. Harvard University, Radio Research Laboratory. February 10, 1943.
- M2** Frequency characteristics of wide-band matching sections. (Report No. 23.) Eugene Fubini, Peter J. Sutro and R. F. Lewis. Harvard University, Radio Research Laboratory. April 19, 1943.
- M3** Wide-band transformer from an unbalanced to a

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- balanced line. (Technical Memorandum No. 411-22.) Eugene Fubini and Peter J. Sutro. OEMsr-411; Research Project No. RP-107. Harvard University, Radio Research Laboratory. October 28, 1943.
- M4** Principles for the design of small power transformers. (Report No. 411-78.) John P. Woods. OEMsr-411; Research Project No. RP-178. Harvard University, Radio Research Laboratory. January 25, 1944.
- M5** An approximate theory of eddy current loss in transformer cores excited by sine wave or by random noise. (Report No. 411-264.) David Middleton. OEMsr-411; Project Nos. RP-187 and SC-94.16. Harvard University, Radio Research Laboratory. October 25, 1945.
- M6** Video transformers for noise voltage. (Report No. 411-244.) J. D. Cobine, J. R. Curry and others. OEMsr-411; Project Nos. RP-187 and SC-94.16. Harvard University, Radio Research Laboratory. October 30, 1945.
- 382 Amplifier**
- M1** Class B video amplifiers for power amplification of noise energy. (Report No. 411-172.) John F. Byrne. OEMsr-411; Research Project No. RP-405A. Harvard University, Radio Research Laboratory. April 11, 1945.
- 383 Circuits and Networks**
- M1** Type II admittance transforming networks. (Memorandum No. MM-43-160-85.) Charles R. Burrows. Bell Telephone Laboratories, Inc. June 18, 1943.
- M2** Broad-band amplification with grounded grid circuits. (Report No. 931-8.) Siegfried Hansen. OEMsr-931; Research Project No. RP-156. General Electric Company. February 10, 1944.
- M3** The R-1700 wide-band regenerative circuit. (Technical Memorandum No. 411-98.) R. C. Raymond and Seymour B. Cohn. OEMsr-411; Research Project No. RP-117. Harvard University, Radio Research Laboratory. April 3, 1944.
- M4** Pulse amplitude selective automatic gain control circuit. (Report No. 895-25.) John B. Atwood and Grant E. Hansell. OEMsr-895; Research Project No. RP-123. Radio Corporation of America. July 22, 1944.
- M5** Applications of Butterfly circuits. (Report No. 411-159.) R. A. Soderman. OEMsr-411; Research Project No. RP-416. Harvard University, Radio Research Laboratory. February 21, 1945.
- M6** A note on ultra high frequency coupled circuits. (Report No. 411-115c.) Paul I. Richards. OEMsr-411; Research Project No. RP-442. Harvard University, Radio Research Laboratory. March 20, 1945.
- M7** Analysis of electrical circuits of the AN/ARC-1 radio set. (Report No. 1024-28.) Elmer H. Scheibe. OEMsr-1024; Project Nos. RP-189 and SC-93.01. Jansky and Bailey. August, 1945.
- M8** Non-linear limiter circuits for use with intensity modulated indicators. (Report No. 411-274.) E. R. Brill. OEMsr-411; Project Nos. RP-406, SC-92.01 and others. Harvard University, Radio Research Laboratory. August 1, 1945.
- M9** A high-speed sweep generator with sectional scan. (Report No. 411-285.) Raymond K. Vermillion. OEMsr-411; Research Project No. RP-306. Harvard University, Radio Research Laboratory. November 1, 1945.
- 384 Crystal Rectifiers**
- M1** Crystal rectifiers as peak voltmeters. (Report No. 923-2.) A. P. G. Peterson. OEMsr-923; Research Project No. RP-270. General Radio Company. January 7, 1944.
- 384.1 Types**
- 384.11 Germanium**
- M1** Reciprocity failure in welded germanium crystals. (Report No. 931-20.) J. Dickey and L. Apker. OEMsr-931; Project Nos. RP-392, SC-99.06 and AC-299.06. General Electric Company. September 28, 1945.
- 384.2 Detectors and Mixers**
- M1** Demodulation effect. (Report No. 895-28.) J. Ernest Smith, Eugene R. Shenk and James R. Weiner. OEMsr-895; Research Project No. RP-229. Radio Corporation of America. September 18, 1944.
- M2** Note on reciprocity failure in crystal mixers. (Report No. 931-16.) L. Apker. OEMsr-931; Research Project No. RP-392. General Electric Company. March 9, 1945.
- 390 Miscellaneous Countermeasure Equipment**
- 391 Power Supply**
- M1** Network for regulating alternating-current voltage from variable speed generator. (Report No. 37.) John P. Woods. Harvard University, Radio Research Laboratory. May 7, 1943.
- M2** [A] 30-kw airborne auxiliary high-voltage direct-current power source. (Technical Memorandum No. 411-103.) W. G. Dow. OEMsr-411; Research Project No. RP-321. Harvard University, Radio Research Laboratory. April 24, 1944.
- See: 240 for Confusion Devices**
- 400 JAMMING SYSTEMS**
- 401 Airborne Systems**
- 401.1 AN/APQ-1 (Carpet Sweeper)**
- M1** [The] AN/APQ-1 (F-1800) Carpet Sweeper [jamming system]. (Test Specification No. TS-7.) R. B. Monroe and R. R. Rhiger. Harvard University, Radio Research Laboratory. August 24, 1943.

- M2** Preliminary specifications for AN/APQ-1 test equipment. (Technical Memorandum No. 411-12.) John N. Dyer. OEMsr-411; Research Project Nos. RP-289 and RP-290. Harvard University, Radio Research Laboratory. October 13, 1943.
- 401.2 AN/ARQ-2 and AN/ART-3 (Jackal)**
- M1** Tests on AN/ARQ-2, Jackal. (Preliminary Report No. 966-9.) V. A. Douglas. OEMsr-966. Bell Telephone Laboratories, Inc. August 10, 1943.
- M2** Supplementary tests of effectiveness of Jackal, AN/ARQ-2, equipment. (Report No. 966-20.) V. A. Douglas. OEMsr-966. Bell Telephone Laboratories, Inc. October 22, 1943.
- M3** Modifications to Jackal, AN/ART-3 (XA-1). (Technical Memorandum No. 1045-1.) J. W. Keuffel. OEMsr-1045; OSRD Liaison Office No. WA-3045-3. Harvard University, American-British Laboratory. September 7, 1944.
- M4** Jamming trials of Jackal, AN/ART-3 (XA-1). (Technical Memorandum No. 1045-2.) D. K. Reynolds. OEMsr-1045. Harvard University, American-British Laboratory. September 21, 1944.
- M5** Comparison of several types of microphones in effectiveness tests using FuGe 16 as the victim link. (Report No. 966-39.) J. L. Lindner and G. J. Heinzelman. OEMsr-966; Research Project No. RP-109. Bell Telephone Laboratories, Inc. October 3, 1944.
- M6** Effectiveness tests on AN/ART-3, Jackal, jammer against SCR-608, SCR-609 and German UkwEe equipments. (Report No. 966-37.) G. J. Heinzelman. OEMsr-966; Research Project No. RP-109. Bell Telephone Laboratories, Inc. October 12, 1944.
- 401.21 Jostle IV**
- M1** [The] Jostle IV [transmitter] field tests. (Technical Memorandum No. 1045-3.) Richard C. King. OEMsr-1045; Research Project No. RP-986; OSRD Liaison Office No. WA-3969-10A. Harvard University, American-British Laboratory. February 23, 1945.
- 401.3 AN/APQ-20, -21 and -27**
- M1** Flight tests of APQ-20 in [a] B-17. (Report No. 411-187.) James M. Moran. OEMsr-411; Project Nos. RP-454, AC-294.20 and NA-189. Harvard University, Radio Research Laboratory. May 23, 1945.
- M2** Preliminary flight tests of APQ-20 in [a] B-29. (Report No. 411-187A.) James M. Moran. OEMsr-411; Project Nos. RP-454 and AC-294.20. Harvard University, Radio Research Laboratory. June 9, 1945.
- M3** The AN/APQ-20 spot jamming system. (Report No. 411-265.) Warren D. White and James L. Clark. OEMsr-411; Project Nos. RP-424, AC-294.20 and NA-189. Harvard University, Radio Research Laboratory. October 1, 1945.
- M4** The S-5000 spot jamming system, service designation AN/APQ-27. (Report No. 411-266.) Warren D. White and James L. Clark. OEMsr-411; Project Nos. RP-424, AC-294.20 and NA-189. Harvard University, Radio Research Laboratory. October 1, 1945.
- M5** The AN/APQ-21 airborne system. (Report No. 411-296.) W. R. Rambo. OEMsr-411; Project Nos. RP-455, AC-294.20 and NA-189. Harvard University, Radio Research Laboratory. December 14, 1945.
- 401.4 NLS-518 Interference Generator**
- M1** Type NLS-518 interference generator, built per Proposal 106 of May 22, 1941. (Report No. 285-2.) (n.a.) [OEMsr-285;] Research Project No. C-26. International Telephone and Radio Manufacturing Corporation. February 17, 1942.
- M2** The interference generator. (Technical Memorandum No. 21.) Albert Preisman. [OEMsr-285;] International Telephone and Radio Manufacturing Corporation. June 19, 1942.
- M3** Final report on Project C-26, concerning [the] developmental model of an interference generator for the 15- to 30-megacycle spectrum. (Report No. 285-1.) Albert Preisman. OEMsr-285; Project Nos. C-26 and SC-19. International Telephone and Radio Manufacturing Corporation. June 19, 1942.
- 401.5 Miscellaneous Airborne System Factors**
- M1** Raven installations and tests on Navy PB4Y-2 reconnaissance aircraft, Albatross I. (Report No. 411-111.) R. L. Hammett. OEMsr-411; Research Project No. RP-242. Harvard University, Radio Research Laboratory. September 20, 1944.
- 402 Ground Systems**
- 402.1 A-500 (Tuba)**
- M1** On the use of a high-power ground jammer against the German A-1 radar. (Report No. 411-88.) W. G. Dow and J. Galt. OEMsr-411; Research Project No. RP-100. Harvard University, Radio Research Laboratory. March 22, 1944.
- M2** Proof-of-performance measurements of Tuba, A-500C. (Report No. 411-155.) D. A. Peterson. OEMsr-411; Research Project No. RP-100. Harvard University, Radio Research Laboratory. February 2, 1945.
- M3** Report on Radio Research Laboratory Project A-500, Tuba. (Report No. 411-222.) J. J. Livingston, W. W. Salisbury and E. S. Welch, Jr. OEMsr-411; Research Project No. RP-100. Harvard University, Radio Research Laboratory. August 13, 1945.
- 402.2 AN/MRT-1 (Cigar)**
- M1** Mechanical frequency modulation jammers. Effectiveness against amplitude modulation voice links.

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- (Report No. 966-25.) V. A. Douglas, E. O. Bernard and M. I. Risley. OEMsr-966; Research Project No. RP-109. Bell Telephone Laboratories, Inc. April 7, 1944.
- M2** High-power communications jammer. (Report No. 1107-1.) Robert M. Baker and Benedict Cassen. OEMsr-1107; Research Project No. RP-197. Westinghouse Electric and Manufacturing Company, Inc. April 10, 1944.
- M3** High-power communications jammer. (Report No. 1107-2.) David Bartlett. OEMsr-1107; Research Project No. RP-197. Westinghouse Electric and Manufacturing Company, Inc. June 11, 1944.
- M4** Modification of British ground Cigar for spot jamming. (Report No. 1045-10.) W. E. Evans. OEMsr-1045; OSRD Liaison Office No. WA-3057-2. Harvard University, American-British Laboratory. July 20, 1944.
- M5** Suppression of harmonics in 15-kw Cigar output. (Report No. 940-17.) J. P. Schafer and L. E. Hunt. OEMsr-940; Research Project No. RP-356. Bell Telephone Laboratories, Inc. October 16, 1944.
- M6** Audio frequency modulation for 15-kw Cigar. (Report No. 940-18.) J. P. Schafer. OEMsr-940; Research Project No. RP-356. Bell Telephone Laboratories, Inc. October 16, 1944.
- M7** Noise modulation of 15-kw ground Cigar. (Report No. 940-19.) J. P. Schafer, L. E. Hunt and G. V. Dale. OEMsr-940; Research Project No. RP-356. Bell Telephone Laboratories, Inc. October 17, 1944.
- M8** [The] 15-kw communications jammer, AN/MRT-1. [The] MX255/MRT-1 modification kit for AN/MRT-1. (Report Nos. 1309- and 1310-1.) Joseph T. Thwaites. OEMsr-1309 and OEMsr-1310; Project Nos. RP-356A and SC-95.03. Westinghouse Electric and Manufacturing Company, Inc. April 14, 1945.
- 402.3 AN/URQ-1 (Stopwatch)**
- M1** Stopwatch. (Report No. 895-34.) W. A. Anderson. OEMsr-895; Research Project No. RP-263. Radio Corporation of America. January 18, 1945.
- M2** Stopwatch. (Report No. 1428-1.) Edward Ruth, III. OEMsr-1428; Project Nos. RP-263a, NS-203 and NS-395.02. Erco Radio Laboratories, Inc. December 13, 1945.
- M3** Preliminary instruction manual for AN/URQ-1 [jammer unit]. (Report No. 1428-2.) (n.a.) OEMsr-1428. Erco Radio Laboratories, Inc. (n.d.)
- 402.4 Miscellaneous Ground Systems**
- M1** Developmental model of an interference generator for the 2- to 20-megacycle spectrum. (Final Report No. 30.) Madison Cawein. OEMsr-89; Project Nos. NDRC-58, C-25 and SC-19. Farnsworth Television and Radio Corporation. May 1, 1942.
- M2** Mobile transmitting system. (Report No. 1305-29.) R. F. Schulz and Arthur C. Weid. OEMsr-1305; Project Nos. RP-117c and SC-98.09. Airborne Instruments Laboratory, Inc. February 28, 1946.
- M3** Preliminary instructions for interference generator, NDRP-58. (Report No. 89-2. Instruction Book No. 3.) (n.a.) OEMsr-89; Project Nos. C-25 and SC-19. Farnsworth Television and Radio Corporation. (n.d.)
- 403 Shipboard Systems**
- 403.1 Peter**
- M1** Peter tests on Chesapeake Bay. (Report No. 931-2.) Siegfried Hansen and H. H. Race. OEMsr-931; Research Project No. RP-156. General Electric Company. August 24, 1943.
- M2** Peter test at Radio Research Laboratory. (Report No. 931-3.) Siegfried Hansen and H. H. Race. OEMsr-931; Research Project No. RP-156. General Electric Company. September 22, 1943.
- M3** Peter tests for British Navy. (Report No. 2.) Siegfried Hansen. [OEMsr-1045;] Research Project No. RP-156. Harvard University, American-British Laboratory. December 18, 1943.
- M4** Peter trials at Tantallon, March 17 [to] 25, 1944. (Report No. 1045-4.) Siegfried Hansen and H. H. Race. [OEMsr-1045; Research Project No. RP-156.] Harvard University, American-British Laboratory. April 2, 1944.
- M5** Project Peter. (Report No. 931-10.) H. H. Race and Siegfried Hansen. OEMsr-931; Research Project No. RP-156. General Electric Company. July 14, 1944.
- M6** Project Peter. (Report No. 931-25.) Siegfried Hansen. OEMsr-931; Project Nos. RP-156 and NS-251. General Electric Company. November 16, 1945.
- 403.2 X-MBT (Elephant)**
- M1** The low-frequency Elephant transmitter. (Report No. 411-270.) W. R. Rambo. OEMsr-411; Project Nos. RP-461, SC-94.25 and NS-394.10. Harvard University, Radio Research Laboratory. October 22, 1945.
- M2** Shipboard trials of the X-MBT radar intercept and jamming system. (Report No. 411-290.) J. W. Kearney. OEMsr-411; Project Nos. RP-457, SC-94.25 and NS-394.10. Harvard University, Radio Research Laboratory. January 18, 1946.
- M3** Preliminary instructions for Elephant, S-9000. ([Instruction Book] No. 411-IB-51.) (n.a.) OEMsr-411; Project Nos. RP-457, SC-94.25 and NS-394.10. Harvard University, Radio Research Laboratory. March 26, 1946.
- 403.3 Miscellaneous Shipboard Systems**
- M1** Study of power requirements for S-band jamming from surface vessels. (Report No. 411-133.) Warren D. White. OEMsr-411; Research Project No. RP-169. Harvard University, Radio Research Laboratory. December 13, 1944.

404 Miscellaneous System Tests

- M1** Comparison of APQ-2 and APT-1 plus AM-18 for jamming effectiveness at 206 mc. (Report No. 411-135. Originally issued as Test Report No. 411-TR-46.) D. A. Peterson. OEMsr-411. Harvard University, Radio Research Laboratory. December 8, 1944.
- M2** Comparison of APQ-2 and APT-1 plus AM-18/APT for jamming effectiveness at 210 mc. (Report No. 411-135A.) J. F. Youngblood, R. E. Anderson and G. D. Hagen. OEMsr-411. Harvard University, Radio Research Laboratory. February 12, 1945.
- M3** The E-3200 X-band jamming system. (Report No. 411-256.) R. E. Kell. OEMsr-411; Project Nos. RP-221 and NA-156. Harvard University, Radio Research Laboratory. September 26, 1945.

See also: 263 for Systems Against Guided Missiles

410 Special Jamming Systems

411 Automatic Tuning

- M1** Automatic radar jamming system. Code name: Pimpernel. (Report No. CBS-127.) (n.a.) OEMsr-653. Columbia Broadcasting System, Inc. June 2, 1943.
- M2** Automatic tuning in jamming equipment. (Report No. 993-1.) H. M. Straube. OEMsr-993; Research Project No. RP-122. Western Electric Company, Inc. August 13, 1943.
- M3** [The] U-600 automat. (Technical Memorandum No. 411-129.) H. E. Overacker. OEMsr-411; Research Project No. RP-380. Harvard University, Radio Research Laboratory. July 3, 1944.
- M4** Automatic search jammer, Broom. (Report No. 1305-11.) R. F. Schulz and E. W. Adams, Jr. OEMsr-1305; Project Nos. RP-359, SC-98.07 and NA-109. Airborne Instruments Laboratory, Inc. April 21, 1945.
- M5** Automatic search jammer, Beagle. (Report No. 1305-20.) W. I. L. Wu and Arthur C. Weid. OEMsr-1305; Project Nos. RP-360, SC-98.07 and NA-109. Airborne Instruments Laboratory, Inc. August 31, 1945.
- M6** [The] Piano, signal repeating jammer. (Report No. 1305-23.) Otto H. Schmitt. OEMsr-1305; Project Nos. RP-362, [SC-]98.07 and NA-109. Airborne Instruments Laboratory, Inc. December 14, 1945.

412 Expendable Jammers (Chicks)

- M1** Mechanical design of Chicks. (Parts I and II. Report No. 940-13.) R. C. Shaw and R. W. Friis. OEMsr-940; Research Project No. RP-132. Bell Telephone Laboratories, Inc. March 20, 1943.
- M2** Tests on experimental spark jammer, Chick I. (Preliminary Report No. 966-7.) V. A. Douglas. OEMsr-966. Bell Telephone Laboratories, Inc. July 9, 1943.
- M3** Jamming. Optimum size of Chicks. (Preliminary Report No. 966-12.) A. C. Peterson. OEMsr-966.

Bell Telephone Laboratories, Inc. August 2, 1943.

- M4** Considerations concerning radar Chicks. (Report No. 59.) Eugene Fubini and T. S. Kuhn. Harvard University, Radio Research Laboratory. September 17, 1943.
- M5** A novel method of frequency modulation, and a 10-watt expendable jammer. (Report No. 940-10.) L. G. Young. OEMsr-940; Research Project No. RP-132. Bell Telephone Laboratories, Inc. December 9, 1943.
- M6** Jamming. Analysis of Chick problem. (Report No. 966-22.) G. J. Heinzelman. OEMsr-966; Research Project No. RP-132. Bell Telephone Laboratories, Inc. February 5, 1944.
- M7** [An] expendable jammer, [the] Deal vacuum tube, 1- to 7-mc Dina Chick. (Report No. 940-14.) J. P. Schafer, L. E. Hunt and others. OEMsr-940; Research Project No. RP-132. Bell Telephone Laboratories, Inc. April 1, 1944.
- M8** Performance of Chick jammers. (Report No. 966-28.) G. J. Heinzelman and J. W. Emling. OEMsr-966; Research Project No. RP-132. Bell Telephone Laboratories, Inc. June 15, 1944.

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TESTING EQUIPMENT AND MEASUREMENTS

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Testing Equipment

- M1** Radio countermeasure test equipment summary, as of January 1, 1944. (Technical Memorandum No. 411-45.) John F. Byrne. OEMsr-411. Harvard University, Radio Research Laboratory. January 14, 1944.

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Test Oscillators

- M1** Type P523-A oscillator, tentative specifications. (Technical Memorandum No. 411-97.) A. P. G. Peterson, OEMsr-411; Research Project No. RP-195. Harvard University, Radio Research Laboratory. June 18, 1943.
- M2** Tentative specifications for test oscillator, A-2651-Y, to go with AN/APR-5 and AN/APR-6 receivers. (Technical Memorandum No. 411-4.) James H. Eldredge, Jr. and R. B. Holt. OEMsr-411; Research Project No. RP-292. Harvard University, Radio Research Laboratory. October 9, 1943.
- M3** Type P523-A test oscillator. (Report No. 923-1.) David B. Sinclair and R. A. Soderman. OEMsr-923; Research Project No. RP-270. General Radio Company. December 7, 1943.
- M4** Handbook of maintenance instructions for U-800 test oscillator. ([Instruction Book] No. 411-IB-78.) (n.a.) OEMsr-411; Research Project No. RP-306. Harvard University, Radio Research Laboratory. March 29, 1945.

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Signal and Pulse Generators

(See also: 620)

- M1** [The] B-502 jamming signal generator. (Report No. 14.) Roger J. Pierce. Harvard University, Radio Research Laboratory. December 28, 1942.
- M2** Preliminary instructions [for the] B-501 pulse

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signal generator. (Report No. 22.) Roger J. Pierce. Harvard University, Radio Research Laboratory. March 20, 1943.

- M3** Pulsed signal generator. (Report No. 867-2.) Paul S. Hendricks. OEMsr-867; Research Project No. RP-241. Columbia Broadcasting System, Inc. July 2, 1943.
- M4** Pulse generator. (Report No. 867-4.) Paul S. Hendricks. OEMsr-867; Research Project No. RP-241. Columbia Broadcasting System, Inc. August 5, 1943.
- M5** A wide-band radio frequency sweep generator. (Technical Memorandum No. 411-5.) C. B. Clark and John P. Woods. OEMsr-411; Research Project No. RP-110. Harvard University, Radio Research Laboratory. March 15, 1944.
- M6** Field tests of L-105 jamming signal generator against Mark 8 fire control radar. (Technical Memorandum No. 411-107.) W. W. Farley. OEMsr-411; Research Project No. RP-385. Harvard University, Radio Research Laboratory. May 1, 1944.
- M7** Type P525-A signal generator. (Report No. 923-3.) A. P. G. Peterson. OEMsr-923; Research Project No. RP-160. General Radio Company. June 5, 1944.
- M8** [The] U-700 jamming signal generator. (Test Report No. 411-TR-42.) J. C. Riley, R. R. Rhiger and others. [OEMsr-411.] Harvard University, Radio Research Laboratory. September 25, 1944.
- M9** [The] U-700 jamming signal generator. (Test Report No. 411-TR-42A.) R. R. Rhiger, F. Malcolm Gager and others. [OEMsr-411.] Harvard University, Radio Research Laboratory. January 26, 1945.
- M10** [The] P-525A signal generator. (Test Report No. 411-TR-23b.) H. W. Belles, F. Malcolm Gager and others. [OEMsr-411.] Harvard University, Radio Research Laboratory. March 8, 1945.
- M11** Preliminary handbook of maintenance instructions for [the] U-1101 test signal generator, TS-406-(XR-1)/UP. ([Instruction Book] No. 411-IB-88.) (n.a.) OEMsr-411; Project Nos. RP-476, AC-299.07 and NA-223. Harvard University, Radio Research Laboratory. July 14, 1945.
- M12** Development of the U-1500 standard signal generator (TS-403/U) for the frequency range 1800 [to] 4000 megacycles. (Report No. 411-277.) W. B. Wholey. OEMsr-411; Project Nos. RP-469, AC-299.07 and NA-223. Harvard University, Radio Research Laboratory. October 22, 1945.

512.1 Pulsed Oscillator

- M1** Mounting of a Hewlett-Packard audio oscillator in a standard aircraft rack. (Technical Memorandum No. 411.94.) Compiled by: John H. Jasberg. OEMsr-411; Research Project No. RP-315. Harvard University, Radio Research Laboratory. April 15, 1944.
- M2** [The] A-2651-Y pulsed oscillator. (Technical Mem-

orandum No. 411-112.) (n.a.) OEMsr-411; Research Project No. RP-292. Harvard University, Radio Research Laboratory. May 2, 1944.

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Spectrum Analyzer

- M1** Operating instructions for [the] D-1202-A spectrum analyzer. (Report No. 25.) W. B. Caufield. Harvard University, Radio Research Laboratory. April 30, 1943.
- M2** Specifications for the D-1203 panoramic spectrum analyzer. (Technical Memorandum No. 411-6.) W. B. Caufield. OEMsr-411; Research Project No. RP-175. Harvard University, Radio Research Laboratory. October 13, 1943.
- M3** Spectrum analyzer. (Report No. 931-9.) J. H. Rubel, T. Hudspeth and R. E. Troell. OEMsr-931; Research Project No. RP-347. General Electric Company. March 18, 1944.
- M4** Video spectrum analyzer. (Report No. 411-96.) G. P. McCouch and P. S. Jastram. OEMsr-411; Research Project No. RP-176. Harvard University, Radio Research Laboratory. July 10, 1944.
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- M10** Theory of a double-mixer for spectrum analyzer applications. (Report No. 931-17.) L. Apker, E. Taft and J. Dickey. OEMsr-931; Project Nos. RP-392, SC-99.06 and AC-299.06. General Electric Company. April 2, 1945.
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J. C. Riley. OEMsr-411. Harvard University, Radio Research Laboratory. November 24, 1945.

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- M2** Preliminary specifications for B-3000 heterodyne frequency meter. (Technical Memorandum No. 411-13.) George Evans. OEMsr-411; Research Project No. RP-245. Harvard University, Radio Research Laboratory. August 23, 1943.
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- M2** The U-400 noise tube tester. (Technical Memorandum No. 411-63.) C. D. Jeffries. OEMsr-411; Research Project No. RP-266. Harvard University, Radio Research Laboratory. February 8, 1944.
- M3** Range extender for General Radio 760-A sound analyzer. (Report No. 411-162.) J. D. Cobine and J. R. Curry. OEMsr-411; Research Project No. RP-187. Harvard University, Radio Research Laboratory. March 10, 1945.
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- M1** [A] peak reading voltmeter. (Report No. 411-124.) P. S. Jastram. OEMsr-411; Research Project No. RP-187. Harvard University, Radio Research Laboratory. April 5, 1945.
- M2** Probe voltmeters. (Report No. 411-177.) J. G. C. Swinney, Jr. OEMsr-411. Harvard University, Radio Research Laboratory. May 5, 1945.

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- M1** The A-741 test transmitter. (Technical Memorandum No. 411-8.) Robert B. Barnes. OEMsr-411; Research Project No. RP-147. Harvard University, Radio Research Laboratory. May 31, 1943.
- M2** The A-2107 test buzzer. (Technical Memorandum No. 411-9.) H. T. O'Neill. OEMsr-411; Research

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- M3** Radio frequency voltage regulator. (Technical Memorandum No. 411-105.) Seymour B. Cohn. OEMsr-411; Research Project No. RP-306. Harvard University, Radio Research Laboratory. April 26, 1944.

520 Measurements

521 Power

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- M2** Measurement of radio frequency power by the equivalent signal method. (Report No. 411-280A.) Harold L. Crispell. OEMsr-411. Harvard University, Radio Research Laboratory. November 9, 1945.

521.1 Wattmeter

521.11 Thermistor

- M1** A self-calibrating thermistor bridge. (Report No. 411-247.) L. A. Manning. OEMsr-411; Project Nos. RP-306 and AC-299.07. Harvard University, Radio Research Laboratory. September 13, 1945.
- M2** Microwave wattmeter. (Report No. 411-246.) Charles F. Hadley. OEMsr-411; Project Nos. RP-306 and AC-299.06. Harvard University, Radio Research Laboratory. September 25, 1945.

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- M2** [A] radio frequency wattmeter for the 1000-mc [to] 3000-mc range. (Report No. 411-209.) W. R. Rambo. OEMsr-411; Project Nos. RP-169 and AC-294.20. Harvard University, Radio Research Laboratory. June 22, 1945.
- M3** Calorimeter-type radio frequency wattmeter. (Report No. 411-280B.) J. R. Marshall. OEMsr-411. Harvard University, Radio Research Laboratory. November 26, 1945.

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- M2** Power output indicators. (Report No. 411-127.) (n.a.) OEMsr-411; Research Project No. RP-290. Harvard University, Radio Research Laboratory. November 17, 1944.

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- M2** A square root amplifier. (Report No. 759-24.) Eric W. Vaughan and Norman Kennedy. OEMsr-759. Ohio State University. May 29, 1944.
- M3** Radio frequency dummy load. ([Technical Memorandum] No. 1305-2.) Otto H. Schmitt and Lyman C. Ihrig. OEMsr-1305. Airborne Instruments Laboratory, Inc. August 31, 1945.
- M4** Measurement of radio frequency power by the coaxial thermocouple lossy line method. (Report No. 411-280.) R. R. Rhiger, F. Malcolm Gager and J. R. Marshall. OEMsr-411; Research Project No. RP-409. Harvard University, Radio Research Laboratory. October 25, 1945.

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- M1** Analysis of ultra high frequency resonant systems by external impedance measurements. (Report No. 411-160.) Gunnar Hok. OEMsr-411; Research Project No. RP-321. Harvard University, Radio Research Laboratory. February 28, 1945.

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- M1** Measurement of attenuation of microwave filters. (Report No. 411-281.) R. R. Rhiger and F. Malcolm Gager. OEMsr-411. Harvard University, Radio Research Laboratory. October 24, 1945.

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- M1** The F-2305 transmitter output indicator. (Technical Memorandum No. 411-18.) Warren D. White. OEMsr-411; Research Project No. RP-290. Harvard University, Radio Research Laboratory. July 30, 1943.

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- M2** Vacuum thermocouples used in standing wave detectors. (Report No. 1019-3.) H. C. Hertha. OEMsr-1019; Project Nos. RP-158A, SC-94.25 and NS-394.02. General Electric Company. October 1, 1945.
- M3** Voltage-standing wave ratio measuring equipment. (Report No. 411-293.) J. R. Marshall. OEMsr-411. Harvard University, Radio Research Laboratory. November 26, 1945.

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- M1** The spectrum of clipped noise. (Report No. 51.) John H. Van Vleck. Harvard University, Radio Research Laboratory. July 21, 1943.

- M2** The equalization of noise amplifiers. (Report No. 411-225.) J. R. Curry. OEMsr-411; Project Nos. RP-187a and SC-94.16. Harvard University, Radio Research Laboratory. August 6, 1945.

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- M2** Notes on receiver sensitivity. (Report No. 411-279.) H. W. Belles, Harold L. Crispell and F. Malcolm Gager. OEMsr-411. Harvard University, Radio Research Laboratory. October 29, 1945.

600 **TRAINING EQUIPMENT**610 **Transmitters**

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- M2** Handbook of maintenance instructions for [the] F-3800 transmitter, AN/UPT-T4. ([Instruction Book] No. 411-IB-61.) (n.a.) OEMsr-411; Research Project No. RP-323. Harvard University, Radio Research Laboratory. February 23, 1945.

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- M2** Preliminary operating instructions for [the] F-4100 training oscillator. ([Instruction Book] No. 411-IB-22.) Elton Barrett. OEMsr-411. Harvard University, Radio Research Laboratory. March 1, 1944.
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- M2** [The] A-1700 jamming signal generator. ([Instruction Book] No. 411-IB-18.) Ralph H. Hoglund. OEMsr-411; Research Project No. RP-191. Har-

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December 7, 1944.

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- 721 **Tennessee Manoeuvres**
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- 722 **Florida**
M1 Results of very high frequency jamming at Orlando. (Report No. 966-13.) C. L. Cahill. OEMsr-966. Bell Telephone Laboratories, Inc. September 22, 1943.
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- 800 **MISCELLANEOUS RADIO COUNTERMEASURES RESEARCH PROBLEMS**
- 810 **Wave Propagation Studies**
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- 820 **Reflection Factors**
- 821 **Antireflective Tow Cables**
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- 822 **Bomber Reflection Patterns**
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- 840 **See-Saw Signals**
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- M2** Conference on Eastman Kodak Company defense problems for Section D3 of NDRC. (Progress Report No. 16.1-2.) F. M. Bishop. Eastman Kodak Company. November 16, 1942.
- M3** Conference on Eastman Kodak Company defense problems for Division 16 of NDRC. (Progress Report Nos. 16.1-9 and -10.) F. M. Bishop. Eastman Kodak Company. January 13 and February 5, 1943.
- M4** Optical inspection. (Report No. 16.1-139.) Howard S. Coleman. OEMsr-1197; OSRD No. 6103. Pennsylvania State College. October 20, 1945.
- M5** The NDRC Optical Inspection Project at the Pennsylvania State College for the period of October, 1943 to November, 1945. (Report No. 16.1-140.) Howard S. Coleman and Madeline F. Coleman. OEMsr-1197; OSRD No. 6104. Pennsylvania State College. October 21, 1945.
- M6** The Optical Research Laboratory at Harvard. (Report No. 16.1-91.) James G. Baker. OEMsr-474; OSRD No. 4740. Harvard University. December 31, 1945.
- M7** Miscellaneous projects partially completed. (Report No. 16.1-130.) Theodore Dunham, Jr. OEMsr-474; OSRD No. 6028. Harvard University. December 31, 1945.

110 Aerial Optical Equipment

111 Aerial Photography

111.1 Cameras

111.11 Lenses and Lens Testing

- M1** Tests of aerial camera lenses made at Mount Wilson Observatory. (Report No. 16.1-36.) (n.a.) OEMsr-101; OSRD No. 3629. Mount Wilson Observatory. March 15, 1944.
- M2** Optical tests of the Harvard College Observatory distortionless apochromat f/8, focal length 36 inches. (Report No. 16.1-75.) (n.a.) OEMsr-101; OSRD No. 4519. Mount Wilson Observatory. October 10, 1944.
- M3** Optical tests of the Bausch and Lomb telestigmat f/8, focal length 40 inches. (Report No. 16.1-67.) (n.a.) OEMsr-101; OSRD No. 4499. Mount Wilson Observatory. December 5, 1944.
- M4** Optical tests of five lenses for aerial photography.

(Report No. 16.1-100.) (n.a.) OEMsr-101; OSRD No. 5319. Mount Wilson Observatory. September 25, 1945.

- M5** Spherically symmetrical lenses and associated equipment for wide-angle aerial photography. (Report No. 16.1-118.) (n.a.) OEMsr-474; OSRD No. 6016. Harvard University. November 30, 1945.
- M6** Design and development of an automatically focusing 40-inch f/5.0 distortionless telephoto and related lenses for high-altitude aerial reconnaissance. (Report No. 16.1-119.) (n.a.) OEMsr-474; OSRD No. 6017. Harvard University. December 31, 1945.
- M7** Design and development of an 100-inch f/10 anastigmat for aerial reconnaissance at extreme altitudes. (Report No. 16.1-121.) (n.a.) OEMsr-474; OSRD No. 6019. Harvard University. December 31, 1945.
- M8** Apochromatic photographic aerial lenses and other optical instruments making use of synthetic fluoroite. (Report No. 16.1-122.) (n.a.) OEMsr-474; OSRD No. 6020. Harvard University. December 31, 1945.
- M9** Design and development of lenses for rectification of metrogon high obliques. (Report No. 16.1-123.) (n.a.) OEMsr-474; OSRD No. 6021. Harvard University. December 31, 1945.
- M10** Design and development of a 36-inch f/8.0 telephoto for the K-18 camera. (Report No. 16.1-127.) (n.a.) OEMsr-474; OSRD No. 6025. Harvard University. December 31, 1945.
- M11** Lens-film resolving power and aerial image energy distribution of several aerial camera lenses. (Report No. 16.1-149.) (n.a.) OEMsr-392; OSRD No. 6127. Eastman Kodak Company. March 27, 1946.

111.12 Shutters

- M1** Modification of the metrogon shutter to increase its speed. (Final Report No. 16.1-35.) (n.a.) OEMsr-101; OSRD No. 3025. Mount Wilson Observatory. November 1, 1943.
- M2** Aerial camera shutter. (Final Report No. 16.1-57.) (n.a.) OEMsr-710; OSRD No. 4184. Technicolor Motion Picture Corporation. February 28, 1945.
- M3** Shutter development for aerial photography. (Final Report No. 16.1-90.) (n.a.) OEMsr-101; OSRD No. 4739. Mount Wilson Observatory. March 15, 1945.

111.13 Stabilizing Devices

- M1** Stabilizing devices for aerial cameras. (Report No. 16.1-76.) Robert R. McMath and Leo Goldberg. OEMsr-1115; OSRD No. 4530. University of Michigan. December 18, 1944.

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- M2** Aerial camera motions. (Progress Report No. 16.1-98.) Duncan E. MacDonald. OEMsr-203; OSRD No. 5178. Massachusetts Institute of Technology. June, 1945.
- M3** Antivibration and ground speed compensation mounts for aerial cameras. (Report No. 16.1-145.) (n.a.) OEMsr-392; OSRD No. 6123. Eastman Kodak Company. October, 1945.
- M4** Gun camera antivibration mount. (Report No. 16.1-147.) (n.a.) OEMsr-392; OSRD No. 6125. Eastman Kodak Company. October, 1945.
- M5** Stabilized aerial camera mounts. (Report No. 16.1-146.) (n.a.) OEMsr-392; OSRD No. 6124. Eastman Kodak Company. December, 1945.
- 111.14 Film Magazine**
- M1** A device for testing the flatness of film in the A-5 and A-7 magazines under service conditions. (Report No. 16.1-126.) (n.a.) OEMsr-474; OSRD No. 6024. Harvard University. December 31, 1945.
- 111.15 Miscellaneous Camera Problems**
- M1** A method for checking the focus of aerial cameras. (Final Report No. 16.1-58.) (n.a.) OEMsr-710; OSRD No. 4185. Technicolor Motion Picture Corporation. February 28, 1945.
- M2** Two-mirror Schmidt camera for aerial photography. (Final Report No. 16.1-104.) (n.a.) OEMsr-101; OSRD No. 5644. Mount Wilson Observatory. September 25, 1945.
- 111.2 Exposure Meters**
- M1** Development and construction of an exposure meter for use with a standard view finder in aerial photography. (Report No. 16.1-61.) (n.a.) OEMsr-1245; OSRD No. 4392. University of Michigan. January, 1945.
- 111.3 Photogrammetry**
- M1** Examination and test of the flashlight perspective projector. (Progress Report No. 16.1-48.) Robert Singleton. OEMsr-1087; OSRD No. 4027. Merrill Flood and Associates. July 22, 1944.
- M2** Soundings and beach contours with airplane cameras mounted athwartships. (Progress Report No. 16.1-47.) Philip Kissam. OEMsr-1087; OSRD No. 3990. Merrill Flood and Associates. August 3, 1944.
- M3** A procedure for determining the orientation of aerial photographs by pairs. (Report No. 16.1-79.) Robert Singleton. OEMsr-1087; OSRD No. 4708. Merrill Flood and Associates. February 23, 1945.
- M4** A stereoscopic plotter for contouring in orthogonal projection from rectified aerial photographs. (Report No. 16.1-82.) Philip Kissam and Robert Singleton. OEMsr-1087; OSRD No. 4711. Merrill Flood and Associates. April 9, 1945.
- M5** Summary description of existing mapping systems in the United States. (Report No. 16.1-78.) O. M. Miller and Robert Singleton. OEMsr-1087; OSRD No. 4707. Merrill Flood and Associates. May 4, 1945.
- M6** An enlarging camera for use with a fixed rectifier. (Report No. 16.1-81.) Robert Singleton and Marvin Thralls. OEMsr-1087; OSRD No. 4710. Merrill Flood and Associates. May 24, 1945.
- M7** A system for mapping from high oblique aerial photographs. (Report No. 16.1-85.) Robert Singleton, Philip Kissam and O. M. Miller. OEMsr-1087; OSRD No. 4714. Merrill Flood and Associates. June 18, 1945.
- M8** Fixed projection cameras for rectifying high oblique aerial photographs. (Report No. 16.1-80.) Robert Singleton. OEMsr-1087; OSRD No. 4709. Merrill Flood and Associates. October 31, 1945.
- M9** Tests of rectification and plotting of a pair of high oblique photographs. (Report No. 16.1-111.) Robert Singleton. OEMsr-1087; OSRD No. 6039. Merrill Flood and Associates. October 31, 1945.
- M10** Manual on the pinhole rectifying camera. (Report No. 16.1-136.) (n.a.) OEMsr-1039; OSRD No. 6100. Aero Service Corporation. October 31, 1945.
- M11** Manual on the variable-ratio printer. (Report No. 16.1-137.) (n.a.) OEMsr-1039; OSRD No. 6101. Aero Service Corporation. October 31, 1945.
- M12** Airplane photographic tests of lenses, film and filters for oblique photography suitable for mapping purposes. (Report No. 16.1-138.) (n.a.) OEMsr-1039; OSRD No. 6102. Aero Service Corporation. October 31, 1945.
- 111.4 Night Photography**
- 111.41 Cameras**
- M1** Wide-field fast cameras. (Final Report No. 16.1-72.) Louis G. Henyey and Jesse L. Greenstein. OEMsr-1078; OSRD No. 4504. Yerkes Observatory. April 30, 1945.
- M2** A practical application of the Schmidt camera to night photography. (Report No. 16.1-125.) (n.a.) OEMsr-474; OSRD No. 6023. Harvard University. December 31, 1945.
- 111.411 Lenses**
- M1** Wide-field f/1 camera lens. (Report No. 16.1-108.) (n.a.) OEMsr-160; OSRD No. 6030. University of Rochester. September 15, 1945.
- M2** Design and development of several types of 7-inch f/2.5 lenses for night photography. (Report No. 16.1-120.) (n.a.) OEMsr-474; OSRD No. 6018. Harvard University. December 31, 1945.
- 111.5 Pursuit Curves**
- M1** Graphs of pursuit curve characteristics for a pursuit plane flying directly toward the target. (Progress Report No. 16.1-40.) (n.a.) OEMsr-101. Mount Wilson Observatory. February, 1944.
- M2** Graphs of pursuit curve characteristics. (Progress

Report No. 16.1-41.) N. U. Mayall. OEMsr-101. Mount Wilson Observatory. April 5, 1944.

- M3** Instruments for studying pursuit curves. (Report No. 16.1-88.) (n.a.) OEMsr-101; OSRD No. 4737. Mount Wilson Observatory. [May (?) 1945.]

111.6 Resolution

- M1** Resolving power in aerial photography. (Report No. 16.1-50.) (n.a.) OEMsr-101; OSRD No. 4047. Mount Wilson Observatory. May 15, 1944.
- M2** Resolving power targets for aerial photography. (Final Report No. 16.1-60.) Duncan E. MacDonald. OEMsr-203; OSRD No. 4445. Massachusetts Institute of Technology. December, 1944.
- M3** Resolution of aerial cameras in the laboratory and in the air. (Report No. 16.1-89.) (n.a.) OEMsr-101; OSRD No. 4738. Mount Wilson Observatory. March 31, 1944.
- M4** Quantitative studies and observations of factors limiting resolution of aerial photographs. Part I, Flight data and test equipment. Part II, Analysis of data, conclusions and recommendations. Part III, Appendix. (Report No. 16.1-131.) (n.a.) OEMsr-474; OSRD No. 6029. Harvard University. December 31, 1945.

112 Harmonization of Fire Control

112.1 Aircraft Fire Control

- M1** Evaluation of Second Air Force harmonization procedure. (Report No. 16.1-99.) Philip Kissam. OEMsr-1087; OSRD No. 5261. Merrill Flood and Associates. July 11, 1945.
- M2** The harmonization of aircraft remote fire control system. (Report No. 16.1-93.) Philip Kissam. OEMsr-1087; OSRD No. 4787. Merrill Flood and Associates. October 10, 1945.

112.11 Mirror Methods

- M1** The mirror boresight method for harmonization of B-29 remote control turrets. (Report No. 16.1-103.) (n.a.) OEMsr-1087; OSRD No. 5404. Merrill Flood and Associates. August 1, 1945.
- M2** A mirror frame method for harmonizing B-29 guns and sights. (Report No. 16.1-53.) (n.a.) OEMsr-474; OSRD No. 4277. Harvard University. December 31, 1945.

112.12 Wire Methods

- M1** The wire method for harmonization of B-29 remote control turrets. (Report No. 16.1-102.) Max Petersen. OEMsr-203; OSRD No. 5403. Massachusetts Institute of Technology. August 1, 1945.

112.13 Prism Methods

- M1** The prism method for harmonization of B-29 remote control turrets. (Report No. 16.1-101.) (n.a.) OEMsr-160; OSRD No. 5402. University of Rochester. August 1, 1945.

112.2 Reflex Sights

- M1** Reflex sights. (Report No. 16.1-87.) (n.a.) OEMsr-101; OSRD No. 4736. Mount Wilson Observatory. March 20, 1945.
- M2** Reflex sights. (Final Report No. 16.1-69.) Louis G. Henyey, Jesse L. Greenstein and W. A. Hiltner. OEMsr-1078; OSRD No. 4501. Yerkes Observatory. April 30, 1945.
- M3** Development of special reflex gunsights. (Report No. 16.1-110.) (n.a.) OEMsr-160; OSRD No. 6032. University of Rochester. September 27, 1945.

112.3 Light Scattering

- M1** Notes on the scattering of light in optical fire control instruments. (Report No. 16.1-144.) Howard S. Coleman and Samuel W. Harding. OEMsr-1197; OSRD No. 6108. Pennsylvania State College. October 19, 1945.

112.4 Stadiameters

- M1** Stadiameters. (Report No. 16.1-114.) (n.a.) OEMsr-160; OSRD No. 6035. University of Rochester. October 2, 1945.

120 Binoculars and Telescopes

- M1** Binocular developments. (Final Report No. 16.1-33.) (n.a.) OEMsr-579; OSRD No. 4114. Bausch and Lomb Optical Company. December 28, 1944.

121 Night Binoculars and Telescopes

- M1** Aids to night vision. (Progress Report No. 16.1-23.) (n.a.) OEMsr-160; OSRD No. 1482. University of Rochester. March 1, 1943.
- M2** The effects of binocular magnification on the visibility of targets at low levels of illumination. (Final Report No. 16.1-62.) S. Howard Bartley and Eloise Chute. OEMsr-1058; OSRD No. 4433. Dartmouth College. November 30, 1944.
- M3** Wide-field telescopes. (Report No. 16.1-112.) (n.a.) OEMsr-160; OSRD No. 6033. University of Rochester. October 8, 1945.
- M4** The effects of night binocular design features on the visibility of targets at low levels of illumination. (Report No. 16.1-150.) Carl W. Miller and Lloyd H. Beck. OEMsr-1229; OSRD No. 6128. Brown University. October 25, 1945.
- M5** Summary of experimental data. The effects of night binocular design features on the visibility of targets at low levels of illumination. (Report No. 16.1-151.) Carl W. Miller and Lloyd H. Beck. OEMsr-1229; OSRD No. 6129. Brown University. October 25, 1945.

121.1 Physiological Factors

- M1** A study of pupil size at low levels of illumination. (Report No. 16.1-134.) Irving H. Wagman. OEMsr-1228; OSRD No. 6098. University of Pennsylvania. October 15, 1945.
- M2** Physiological factors determining the performance

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of night binoculars. (Report No. 16.1-135.) H. K. Hartline, Irving H. Wagman and others. OEMsr-1228; OSRD No. 6099. University of Pennsylvania. October 31, 1945.

121.2 Infrared Sources

M1 Range of visibility of infrared sources with the naked eye and with binoculars. (Report No. 16.1-106.) Carl W. Miller and Lloyd H. Beck. OEMsr-1229; OSRD No. 5739. Brown University. October 25, 1945.

122 Tank Telescopes

M1 Design of wide-angle telescopes for tanks. (Progress Report No. 16.1-45.) (n.a.) OEMsr-160; OSRD No. 3888. University of Rochester. December 1, 1943.

M2 Tank and antitank telescopes. (Report No. 16.1-71.) Louis G. Henyey, Jesse L. Greenstein and W. A. Hiltner. OEMsr-1078; OSRD No. 4503. Yerkes Observatory. October, 1945.

123 Antioscillation Mounts

M1 Aids to night vision. Antioscillation mounted night sights. (Progress Report No. 16.1-14.) (n.a.) OEMsr-160; OSRD No. 1479. University of Rochester. [March (?) 1943.]

M2 Aids to night vision. (Part III. Progress Report No. 16.1-28.) (n.a.) OEMsr-160; OSRD No. 1709. University of Rochester. [June 15, 1943.]

M3 Antivibration mounted binocular and monocular. (Final Report No. 16.1-63.) Joseph Mihalyi, H. J. Hood and F. M. Bishop. OEMsr-1090; Problem No. DD-1623; OSRD No. 4444. Eastman Kodak Company. February 10, 1945.

M4 Antioscillation mount for binoculars. (Final Report No. 16.1-56.) (n.a.) OEMsr-617; OSRD No. 4183. Technicolor Motion Picture Corporation. February 28, 1945.

M5 Antioscillation mounted high-power telescope. (Report No. 16.1-115.) (n.a.) OEMsr-160; OSRD No. 6036. University of Rochester. October 1, 1945.

M6 Antioscillation mount tests. (Report No. 16.1-113.) (n.a.) OEMsr-160; OSRD No. 6034. University of Rochester. October 2, 1945.

M7 Antivibration mounts for binoculars. (Report No. 16.1-148.) (n.a.) OEMsr-392; OSRD No. 6126. Eastman Kodak Company. November 20, 1945.

130 Periscopes

M1 Unit power periscopes. (Final Report No. 16.1-70.) Louis G. Henyey, Jesse L. Greenstein and W. A. Hiltner. OEMsr-1078; OSRD No. 4502. Yerkes Observatory. September, 1945.

131 Submarine

M1 Rapid processing equipment for periscope photography. (Part II. Final Report No. 16.1-65.) D. C. Harvey and Joseph L. Boon. OEMsr-622; Problem

No. DD-2518A; OSRD No. 4551. Eastman Kodak Company. December 21, 1944.

M2 Study of submarine periscope design. (Final Report No. 16.1-152.) Louis G. Henyey and Jesse L. Greenstein. OEMsr-1078; OSRD No. 6130. Yerkes Observatory. October, 1945.

132 Aircraft

M1 Periscopic scanning device. (Final Report No. 16.1-55.) (n.a.) OEMsr-617; OSRD No. 4182. Technicolor Motion Picture Corporation. February 28, 1945.

M2 P-80 periscope design. (Report No. 16.1-116.) (n.a.) OEMsr-160; OSRD No. 6037. University of Rochester. October 1, 1945.

M3 Training periscope design for Division 6. (Report No. 16.1-117.) (n.a.) OEMsr-160; OSRD No. 6038. University of Rochester. October 1, 1945.

M4 Development of an aircraft periscope, Mark 35, Model O, and of an experimental range finder for antisubmarine aerial patrol planes. (Report No. 16.1-124.) (n.a.) OEMsr-474; OSRD No. 6022. Harvard University. December 31, 1945.

133 Tank

M1 Tank periscope binocular, T-9. (Report No. 16.1-109.) (n.a.) OEMsr-160; OSRD No. 6031. University of Rochester. September 1, 1945.

140 Miscellaneous Optical Instruments

141 Theodolites

M1 Development of a precision theodolite telescope. (Progress Report No. 16.1-31.) (n.a.) OEMsr-385; OSRD No. 1848. University of Rochester. August 15, 1943.

M2 The 0.1-mil recording phototheodolite. (Final Report No. 16.1-107.) J. Leslie Quigley. OEMsr-503; Problem No. DD-2517; OSRD No. 5921. Eastman Kodak Company. December 31, 1945.

142 Navigation Instruments

M1 Two-star navigating instrument. (Report No. 16.1-105.) (n.a.) OEMsr-101; OSRD No. 5645. Mount Wilson Observatory. September 25, 1945.

143 Scanning Devices

M1 Optical scanning devices. (Final Report No. 16.1-13.) Walter S. Adams, Theodore Dunham, Jr. and others. OEMsr-115; OSRD No. 1420. Mount Wilson Observatory. [August (?) 1942.]

144 Antiglare Shutters

M1 Production design of high-speed antiglare shutter. (Progress Report No. 16.1-37.) Joseph Mihalyi and F. M. Bishop. OEMsr-707; OSRD No. 3413. Eastman Kodak Company. February 8, 1944.

M2 High-speed antiglare shutter production design. (Final Report No. 16.1-64.) Joseph Mihalyi and D. C. Harvey. OEMsr-707; Problem No. DD-

2510D; OSRD No. 4446. Eastman Kodak Company. September 28, 1945.

- M3** The development of photoelectric control apparatus for high-speed antiglare shutter to protect night vision of pilots from enemy flares. (Final Report No. 16.1-133.) Seville Chapman. OEMsr-100; OSRD No. 6006. Stanford University. September 30, 1945.

150 Tropical Fouling

- M1** A house for the study of materials under tropical conditions. (Report No. 16.1-49.) W. G. Hutchinson and Robert McCrea. OEMsr-205; OSRD No. 4048. University of Pennsylvania. July 25, 1944.

151 Fouling of Optical Instruments

- M1** Investigation of the causes for the clouding of glass surfaces under tropical field conditions. (Progress Report No. 16.1-17.) Peter Gray. [OEMsr-871.] University of Pittsburgh. [March (?) 1943.]
- M2** Minutes of conference on research conducted in the Canal Zone on the fouling of optical instruments, held July 27, 1943 at the Johnson Research Foundation, University of Pennsylvania, Philadelphia, Pennsylvania. (Report No. 16.1-29.) (n.a.) OSRD No. 1833. Massachusetts Institute of Technology. July 27, 1943.
- M3** Polyvinyl sheeting exposed to tropical conditions. (Report No. 16.1-39.) Peter Gray. OEMsr-871. University of Pittsburgh. March 28, 1944.
- M4** The fungus fouling of optical instruments. (Report No. 16.1-51.) W. G. Hutchinson. OEMsr-205; OSRD No. 4118. University of Pennsylvania. September 30, 1944.
- M5** Tropical testing. (Report No. 16.1-96.) (n.a.) OEMsr-871; OSRD No. 5010. University of Pittsburgh. March 27, 1945.
- M6** Tropical deterioration in optical instruments. (Report No. 16.1-97.) (n.a.) OEMsr-871; OSRD No. 5767. University of Pittsburgh. April 17, 1945.

152 Prevention of Fouling

- M1** Cresatin as a treatment for fungus-proofing optical instruments. (Report No. 16.1-44.) (n.a.) OEMsr-205; OSRD No. 3803. University of Pennsylvania. June 25, 1944.
- M2** Methods of prevention of fungus fouling of optical instruments in the Canal Zone. (Report No. 16.1-46.) (n.a.) OEMsr-205; OSRD No. 3952. University of Pennsylvania. July 25, 1944.
- M3** A method for the prevention of mold growth on optical instruments exposed to tropical conditions. (Report No. 16.1-92.) (n.a.) OEMsr-871; OSRD No. 4371. University of Pittsburgh. December 5, 1944.

160 Optical Instrument Manufacture and Experimentation

161 Materials

161.1 Optical Plastics

- M1** General review of projects and symposium on optical plastics. Minutes of meeting, Washington, D. C., May 6, 1943. (Report No. 16.1-27.) (n.a.) Massachusetts Institute of Technology. August 10, 1943.
- M2** Optical plastic material synthesis, fabrication and instrument design. (Report No. 16.1-59.) (n.a.) OEMsr-70; OSRD No. 4417. Polaroid Corporation. February 1, 1945.
- M3** Tests of optical plastic elements and of reflex sights. (Report No. 16.1-94.) Max Petersen. OEMsr-203; OSRD No. 4788. Massachusetts Institute of Technology. October 15, 1945.

161.11 Artificial Optical Fluorite

- M1** The development of synthetic fluorite crystals. (Progress Report Nos. 16.1-6 and -18.) Donald C. Stockbarger. OEMsr-45. Massachusetts Institute of Technology. February 1 and April 1, 1943.
- M2** Artificial optical fluorite. (Report No. 16.1-77.) Donald C. Stockbarger and Marie Early. OEMsr-45; OSRD No. 4690. Massachusetts Institute of Technology. December 31, 1944.
- M3** Optical working of synthetic crystals. (Final Report No. 16.1-74.) (n.a.) OEMsr-1177; OSRD No. 4506. Perkin-Elmer Corporation. April, 1945.

161.12 Hard Protective Coatings

- M1** Studies and investigations in connection with the development of hard protective coatings for optical plastics and glass. (Bi-monthly Progress Report Nos. 16.1-3, -11, -24, -25, -26, -30, -32, -43 and -52.) (n.a.) OEMsr-657. California Institute of Technology. January 8, 1943 to August 1, 1944.
- M2** Hard protective coatings for optical plastics. (Final Report No. 16.1-54.) Howard J. Lucas, L. Reed Brantley and others. OEMsr-657; OSRD No. 4119. California Institute of Technology. November 30, 1944.

161.2 Glass Molding

- M1** Methods of producing by molding of high-precision optical parts of glass. (Progress Report No. 16.1-8.) J. H. Webb and Loyd A. Jones. OEMsr-421. [Eastman Kodak Company.] February 11, 1943.
- M2** The molding of glass for optical purposes. (Report No. 16.1-68.) (n.a.) OEMsr-421; OSRD No. 4500. Eastman Kodak Company. September 13, 1945.

161.3 Roof Prisms

- M1** Methods of making roof prisms, developed at the Mount Wilson Observatory. (n.a.) OSRD No. 1073. Mount Wilson Observatory. August 1, 1942.
- M2** Diamond milling of roof prism blanks. (Report No. 16.1-86.) (n.a.) OEMsr-101; OSRD No. 4735. Mount Wilson Observatory. March 31, 1945.

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161.4 Reticles

- M1** Studies of the British photographic methods of preparing reticles. (Progress Report No. 16.1-1.) Richard M. Badger, William Shand, Jr. and Rebecca Bradford. OEMsr-389. California Institute of Technology. December 1, 1942.
- M2** Investigation of photographic methods of making reticles. (Progress Report Nos. 16.1-5 and -16.) Richard M. Badger, William Shand, Jr. and Rebecca Bradford. OEMsr-389. California Institute of Technology. February 1 and April 1, 1943.
- M3** An investigation of photographic methods of making reticles. (Report No. 16.1-34.) Richard M. Badger, William Shand, Jr. and others. OEMsr-589; OSRD No. 3219. California Institute of Technology. December 31, 1943.

161.5 Films

- M1** High-efficiency partially reflecting films on glass. (Progress Report No. 16.1-4.) (n.a.) OEMsr-160. University of Rochester. February 1, 1943.
- M2** The evaporation of thin films. (Report No. 16.1-95.) (n.a.) OEMsr-160; OSRD No. 4789. University of Rochester. March 1, 1945.

162 Optical Instrument Testing

162.1 Photoelectric and Photographic Procedures

- M1** Photoelectric and photographic procedures for the evaluation of optical instrument design. (Report No. 16.1-143.) Howard S. Coleman and David G. Clark. OEMsr-1197; OSRD No. 6107. Pennsylvania State College. October 16, 1945.

162.2 Kinetic Definition Chart

- M1** A method of testing the efficiency of an optical instrument using the kinetic definition chart. (Report No. 16.1-42.) (n.a.) OEMsr-1197. Pennsylvania State College. April 25, 1944.
- M2** A description of the kinetic definition chart (KDC) apparatus and its uses. (Report No. 16.1-132.) Howard S. Coleman and Samuel W. Harding. OEMsr-1197; OSRD No. 6005. Pennsylvania State College. October 19, 1945.

162.3 Dioptrimeter

- M1** The dioptrimeter and its use in the inspection of optical instruments. (Report No. 16.1-141.) Howard S. Coleman. OEMsr-1197; OSRD No. 6105. Pennsylvania State College. October 19, 1945.

162.4 Michelson-Twyman Interferometer

- M1** The Penn State I-1 Michelson-Twyman interferometer and its use in determining conformance with design and in quality control of lenses, prisms and telescopic systems. (Report No. 16.1-142.) Howard S. Coleman and David G. Clark. OEMsr-1197; OSRD No. 6106. Pennsylvania State College. October 21, 1945.

170 Aids to Night Vision (General)

- M1** Aids to night vision. Special instruments. (Progress Report No. 16.1-21.) (n.a.) OEMsr-160; OSRD No. 1480. University of Rochester. March 1, 1943.
- M2** Aids to night vision. Extension of the scotopic visibility curve to 3130 angstroms and to 8000 angstroms. (Progress Report No. 16.1-22.) (n.a.) OEMsr-160; OSRD No. 1481. University of Rochester. March 1, 1943.

180 Miscellaneous Optical Problems

- M1** The edge blackening of optical elements of the M-7 binocular and M-70 telescope. (Report No. 16.1-38.) Howard S. Coleman. OEMsr-1197. Pennsylvania State College. March 27, 1944.
- M2** Miscellaneous optical designs. (Report No. 16.1-73.) Louis G. Henyey and Jesse L. Greenstein. OEMsr-1078; OSRD No. 4505. Yerkes Observatory. October, 1945.
- M3** Miscellaneous [optical] development work for other OSRD projects. (Report No. 16.1-128.) (n.a.) OEMsr-474; OSRD No. 6026. Harvard University. December 31, 1945.
- M4** Miscellaneous [optical] projects for instructional and laboratory purposes. (Report No. 16.1-129.) (n.a.) OEMsr-474; OSRD No. 6027. Harvard University. December 31, 1945.

200 FACTORS OF CAMOUFLAGE

- M1** Report of NDRC *ad hoc* Committee on Camouflage. (n.a.) February 25, 1942.

210 Gloss

- M1** Gloss. (Research Paper No. 16.3-4.) S. Q. Duntley. Physical Measurement Laboratory. May 26, 1941.

220 Finishes and Paint

- M1** The preparation and properties of chlorophyll paints. Kenneth V. Thimann and David Kaufman. OEMsr-551; OSRD No. 1026. Harvard University. October 31, 1942.
- M2** Camouflage finishes and related problems. (Report No. 16.3-13.) (n.a.) OEMsr-697; OSRD No. 6557. Interchemical Corporation. September 24, 1945.

230 Color

- M1** Influence of color contrast on visual acuity. (Report No. 16.3-3.) (n.a.) OEMsr-1070; OSRD No. 4541. Eastman Kodak Company. November 1, 1944.
- M2** Transient color phenomena in a desert. (Report No. 16.3-8.) (n.a.) OEMsr-597; OSRD No. 6552. Louis Comfort Tiffany Foundation. April 10, 1945.

240 Reflectance of Target

- M1** Measurement of atmospheric haze and areorelectance. S. Q. Duntley. Physical Measurement Laboratory. March 13, 1944.

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- M2** Reflectance of natural terrains. (Report No. 16.3-10.) (n.a.) OEMsr-597; OSRD No. 6554. Louis Comfort Tiffany Foundation. September 14, 1945.
- 250 Visibility of Target**
- M1** Visibility of targets. (Report No. 16.3-7.) (n.a.) OEMsr-597; OSRD No. 6401. Louis Comfort Tiffany Foundation. October 1, 1945.
- M2** Visibility of targets. (Volumes I to V.) (n.a.) Louis Comfort Tiffany Foundation. (n.d.)
- 260 Camouflage Applications**
- 261 Water Camouflage**
- M1** Water camouflage. (Report No. 16.3-1.) B. T. Mesier. OEMsr-726; Research Project No. PDRC-728. American Cyanamid Company. June 30, 1943.
- 262 Sea-Search Aircraft Camouflage**
- M1** Camouflage of sea-search aircraft, the Yehudi Project. (Report No. 16.3-2.) (n.a.) OEMsr-597; OSRD No. 3816. Louis Comfort Tiffany Foundation. June 1, 1944.
- 263 Glomb Camouflage**
- M1** Camouflage of a glomb. (Report No. 16.3-6.) S. Q. Duntley. OEMsr-1459; OSRD No. 5371. Pratt, Read and Company, Inc. August 31, 1945.
- 270 Instruments**
- 271 Spectrogeograph**
- M1** A spectrograph for aerial use. The spectrogeograph. (Report No. 16.3-5.) Arthur C. Hardy. OEMsr-717; OSRD No. 5444. Eastman Kodak Company. December 9, 1944.
- M2** Calibration and use of the spectrogeograph. (Report No. 16.3-11.) S. Q. Duntley. OEMsr-597; OSRD No. 6555. Louis Comfort Tiffany Foundation. September 24, 1945.
- 272 Optical-Electronic**
- M1** Optionic instruments for the study of camouflage. (Report No. 16.3-12.) (n.a.) OEMsr-697; OSRD No. 6556. Interchemical Corporation. August 25, 1945.
- 273 Photometer**
- M1** An integrating contrast photometer. The High Hill Project. (Report No. 16.3-9.) S. Q. Duntley. OEMsr-597; OSRD No. 6553. Louis Comfort Tiffany Foundation. July 24, 1945.
- 280 Charts**
- 281 Nomographic**
- M1** Nomographic chart. R. D. Douglass. Louis Comfort Tiffany Foundation. (n.d.)
- 300 NEAR INFRARED**
- 301 Equipment**
- 301.1 Light Sources**
- 301.11 Flash Lamps**
- M1** The microflash lamp, Type 200. Development and characteristics. (Report No. 16.4-13.) W. W. McCormick and L. Madansky. NDCrc-185; OSRD No. 1939. University of Michigan. August 21, 1943.
- M2** The high-intensity flash lamp, Type 10. Development and characteristics. (Report No. 16.4-14.) W. W. McCormick and L. Madansky. NDCrc-185. University of Michigan. August 24, 1943.
- M3** The Type 200 microflash lamp, and a microflash unit for ballistic photography. (Final Report No. 16.4-32, covering the period from January 1, 1943 to February 28, 1945.) W. W. McCormick and A. F. Fairbanks. NDCrc-185; Service Project No. OD-147. University of Michigan. April 19, 1945.
- M4** The development of a flashlamp source for an infrared range and direction apparatus. (Final Report No. 16.4-33, covering the period from October 1, 1943 to June 15, 1945.) W. W. McCormick and W. L. Hole. NDCrc-185; Service Project Nos. CE-22 and NR-103; OSRD No. 5296. University of Michigan. August 1, 1945.
- M5** The high-intensity flash lamp, Type 10. (Final Supplementary Report No. 16.4-34, covering the period from August 25, 1943 to March 1, 1945.) W. L. Hole and W. W. McCormick. NDCrc-185; OSRD No. 5297. University of Michigan. October 1, 1945.
- M6** Adaptation of the Type 10 flash lamp to the DeBrie camera. (Report No. 16.4-62, covering the period from February to September, 1944.) A. F. Fairbanks. NDCrc-185; Service Project No. OD-173; OSRD No. 5996. University of Michigan. November 1, 1945.
- 301.12 Arc Lamps**
- M1** Modulator for 100-watt concentrated arc. (Report No. 16.4-17.) B. J. Spence. OEMsr-990; OSRD No. 3123. Northwestern University. January 1, 1944.
- M2** Concentrated-arc lamps. (Final Report No. 16.4-43, covering period from May 12, 1943 to September 1, 1945.) E. C. Homer. OEMsr-984; Service Project No. NS-159; OSRD No. 5300. Western Union Telegraph Company. August 31, 1945.
- M3** The concentrated-arc lamp. (n.a.) Western Union Telegraph Company. (n.d.)
- 301.2 Shutters**
- M1** Development of a photoelastic shutter for modulating infrared light at audio frequencies. (Report No. 16.4-1.) Hans Mueller. OEMsr-576; MIT Re-

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search Project DIC-6085. Massachusetts Institute of Technology. January 1, 1943.

M2 The polarization optics of the photoelectric shutter. (Report No. 16.4-18.) Hans Mueller. OEMsr-576; MIT Research Project DIC-6085. Massachusetts Institute of Technology. November 15, 1943.

M3 A device for tripping the camera shutter in high-speed photography. (Special Report No. 16.4-44.) A. F. Fairbanks. NDCrc-185. University of Michigan. November 1, 1945.

301.3 Transmitting Filters

M1 The transmission of radiation. (Special Report Nos. 16.4-3 and 16.4-4 [covering the] period [from] August 21, 1943 to November 30, 1943.) (n.a.) OEMsr-1085. Polaroid Corporation. [November, 1943.]

M2 Near infrared transmitting filters. (n.a.) OSRD No. 3771. June 1, 1944.

M3 Improved infrared transmitting filters. (Final Report No. 16.4-53, covering the period from August 21, 1943 to October 31, 1945.) Eden H. Land. OEMsr-1085; Service Project Nos. NS-155 and CE-34; OSRD No. 5987. Polaroid Corporation. [December, 1945.]

302 Detection Devices

302.1 Photoconductive Cells

M1 A photocell test set. (Final Report No. 16.4-35, covering the period from November 1, 1943 to July 19, 1944.) W. L. Hole and L. N. Holland. NDCrc-185; Service Project Nos. SC-5, NS-225 and NS-151. University of Michigan. April 4, 1945.

302.11 Thallous Sulfide

M1 Thallous sulfide photoconductive cells. A summary of service characteristics. (Report No. 16.4-7.) W. L. Hole and R. J. Cashman. NDCrc-185 and OEMsr-235. University of Michigan and Northwestern University. March 10, 1943.

M2 Development of sensitive thallous sulfide photoconductive cells for detection of near infrared radiation. (Report No. 16.4-6.) R. J. Cashman. OEMsr-235. Northwestern University. March 17, 1943.

M3 Thallous sulfide photoconductive cell. (Report No. 16.4-39.) C. W. Hewlett, J. J. Fitz Patrick and H. T. Wrobel. OEMsr-1322; Service Project No. NS-225. General Electric Company. [March, 1945.]

M4 A theoretical approach to some fundamental properties of thallous sulfide photoconductive cells. (Special Report No. 16.4-26.) A. W. Ewald, W. L. Hole and G. E. Uhlenbeck. NDCrc-185. University of Michigan. March 15, 1945.

M5 Research on thallous sulfide photoconductive cells. (Report No. 16.4-40.) Arthur R. von Hippel and E. S. Rittner. OEMsr-1036; Service Project Nos.

AC-101, SC-5 and others; OSRD No. 4933. MIT, Laboratory for Insulation Research. April, 1945.

M6 Development of stable thallous sulfide photoconductive cells for detection of near infrared radiation. (Final Report No. 16.4-63, covering the period from December, 1941 to October, 1945.) R. J. Cashman. OEMsr-235; Service Project Nos. NS-151, NS-225 and others; OSRD No. 5997. Northwestern University. October 31, 1945.

M7 Development of methods for manufacturing the Type B thalofide cell. (Final Report No. 16.4-69, covering the period [from] April 16 to October 31, 1945.) Ralph W. Engstrom and Alan M. Glover. OEMsr-1486; Service Project Nos. NS-225, SC-5 and others; OSRD No. 6003. Radio Corporation of America. October 31, 1945.

302.12 Lead Sulfide

M1 Development of sensitive lead sulfide photoconductive cells for detection of intermediate infrared radiation. (Final Report No. 16.4-64, covering the period from January, 1944 to October, 1945.) R. J. Cashman. OEMsr-235; OSRD No. 5998. Northwestern University. October 31, 1945.

M2 Exploratory equipment using the lead-sulfide cell for military detection purposes. (Report No. 16.4-73.) R. B. Allured, J. G. Black and others. NDCrc-185; OSRD No. 6290. University of Michigan. November 1, 1945.

302.13 Selenium Photocell

M1 Selenium photocells. (Progress Report No. 16.4-2.) Arthur R. von Hippel. OEMsr-561; OSRD No. 1326. MIT, Laboratory for Insulation Research. January, 1943.

M2 A new electrolytic selenium photocell. Arthur R. von Hippel, J. H. Schulman and E. S. Rittner. OEMsr-561; OSRD No. 1969. MIT, Laboratory for Insulation Research. June 10, 1943.

302.14 Silicon

M1 An investigation of silicon photoconductive cells. (Final Report No. 16.4-37, covering period [from] October 15, 1943 to March 31, 1944.) G. K. Teal. OEMsr-1231. Bell Telephone Laboratories, Inc. January 4, 1945.

302.2 Photometry

M1 A system of photometry for the near infrared. (Report No. 16.4-5.) G. A. Van Lear, Jr. NDCrc-185. University of Michigan. March 9, 1943.

M2 Notes on generalized photometry, with particular application to the near infrared. Schematic version. (Report No. 16.4-9.) G. A. Van Lear, Jr. NDCrc-185. University of Michigan. May 31, 1943.

M3 Notes on generalized photometry, with particular application to the near infrared. Revised schematic version, approved by combined NAN Committee of C. C. B. on June 10, 1943. (Report No. 16.4-10.)

G. A. Van Lear, Jr. NDCrc-185. University of Michigan. June 16, 1943.

302.21 Phototubes

- M1** Special phototubes and circuit developments. (Technical Report No. 16.4-38, covering the period [from] June 15, 1943 to December 31, 1944.) Madison Cawein. OEMsr-1094; Service Project Nos. NS-159, NR-103 and CE-22; OSRD No. 4760. Farnsworth Television and Radio Corporation. January 29, 1945.
- M2** Special phototubes and circuit developments. (Final Report No. 16.4-48, covering the period [from] January 1, 1945 to August 31, 1945.) Madison Cawein. OEMsr-1094; Service Project Nos. NS-159, NR-103 and CE-22; OSRD No. 5981. Farnsworth Television and Radio Corporation. September 26, 1945.

302.3 JAPIR Equipment

- M1** JAPIR detection equipment. (Final Report No. 16.4-61, covering the period from July, 1944 to September, 1945.) P. H. Geiger and J. G. Black. NDCrc-185; Service Project No. NA-191; OSRD No. 5995. University of Michigan. October 17, 1945.
- M2** Operatory manual for NA-191 equipment. (Special Report No. 16.4-32.) P. H. Geiger, J. G. Black and T. R. Kohler. NDCrc-185; Service Project No. NA-191. University of Michigan. (n.d.)

303 Communication Systems

303.1 Optical

- M1** Theoretical aspects of optical communication systems. (Report No. 16.4-72.) Hartland S. Snyder and John R. Platt. OEMsr-990; Service Project No. NS-159; OSRD No. 6289. Northwestern University. October 31, 1945.
- M2** A portable hand-held infrared optical telephone. (Final Report No. 16.4-68, covering the period from April 1, 1945 to November 30, 1945.) Harvey E. White. OEMsr-1073; Service Project Nos. AC-226.03 and NS-371; OSRD No. 6002. University of California. [December, 1945.]

303.2 Voice and Code

- M1** Receiving unit for voice transmission on light beam. (Report No. 16.4-16.) Everett W. Lothrop, Jr. and Hartland S. Snyder. OEMsr-990. Northwestern University. January 1, 1944.
- M2** Transmission tests of Type N equipment. (Special Report No. 16.4-19.) Walter S. Huxford. Northwestern University. December 14, 1944.
- M3** Infrared communication system. (Final Report No. 16.4-45, covering the period [from] March 1 to July 19, 1945.) F. Smardo. OEMsr-1460. V-M Corporation. July 19, 1945.
- M4** Test No. 1 on US/E-2 Nancy equipment manu-

factured by Belmont Radio Corporation. Tests conducted over the period [from] July 26, 1945 to August 4, 1945. (Special Report No. 16.4-41.) (n.a.) OEMsr-990; Service Project No. NS-159. Northwestern University. September 17, 1945.

- M5** Infrared voice and code communication systems, Navy Type E. (Final Report No. 16.4-65, covering the period from May, 1943 to October, 1945. B. J. Spence. OEMsr-990; Service Project No. NS-159; OSRD No. 5999. Northwestern University. October 31, 1945.
- M6** Infrared voice communication systems for aircraft. (Final Report No. 16.4-66, covering the period from March, 1945 to October, 1945.) Everett W. Lothrop, Jr., John R. Platt and Wallace R. Wilson. OEMsr-990; Service Project Nos. AC-226.03 and AC-226.04; OSRD No. 6000. Northwestern University. October 31, 1945.
- M7** Test No. 1 on US/E-1 Nancy equipment manufactured by Cover Dual Signal Systems, Inc. Tests conducted over the period [from] August 11, 1945 to September 4, 1945. (Special Report No. 16.4-42.) (n.a.) OEMsr-990; Service Project No. NS-159. Northwestern University. November 15, 1945.

303.3 Foreign

- M1** German [infrared] speech communication apparatus, Li-80. (Special Report No. 16.4-1.) C. V. Kent and W. L. Hole. NDCrc-185. University of Michigan. September 11, 1943.
- M2** Japanese light beam telephone, Nikko 130 and 186. (Report No. 16.4-46.) A. H. Nethercot, Jr. and Walter S. Huxford. OEMsr-990; Service Project Nos. SC-126, SC-128 and SC-129; OSRD No. 5763. Northwestern University. August 1, 1945.
- M3** Infrared communication system of Captain Guy Touvet. (Report No. 16.4-67.) B. J. Spence. OEMsr-1391; Service Project No. NS-243; OSRD No. 6001. Northwestern University. October 10, 1945.
- M4** German Lichtsprecher 250/130. (Report No. 16.4-70.) A. H. Nethercot, Jr. and Walter S. Huxford. OEMsr-990; Service Project Nos. SC-126, SC-128 and SC-129; OSRD No. 6200. Northwestern University. October 20, 1945.

304 Recognition and Signalling Systems

304.1 Ship-to-Ship

- M1** An infrared radiation system for recognition and ship-to-ship communications. (Report No. 16.4-23.) J. G. Black and P. H. Geiger. NDCrc-185. University of Michigan. March 1, 1944.
- M2** A near infrared system for recognition and ship-to-ship communication, Type D-2. (Final Report No. 16.4-59, covering the period from March 1, 1944 to October 31, 1945.) J. G. Black, P. H. Geiger and A. F. Fairbanks. NDCrc-185; Service

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Project No. NS-151; OSRD No. 5993. University of Michigan. October 31, 1945.

304.2 Plane

M1 The development of apparatus for the detection of night bombing planes by near infrared radiation. (Progress Report No. 244.) O. S. Duffendack. NDCrc-185; Engineering Research Project No. M-341. University of Michigan. June 1, 1942.

M2 An infrared recognition device developed at the University of Michigan and demonstrated at Norfolk, Virginia, on February 12, 1943. (Report No. 16.4-12.) P. H. Geiger, J. G. Black and E. F. Barker. NDCrc-185. University of Michigan. April 1, 1943.

M3 Plane-to-plane recognition. (Final Report No. 16.4-60, covering the period from July 1, 1944 to October 31, 1945.) P. H. Geiger and J. G. Black. NDCrc-185; Service Project Nos. NA-194 and AC-101; OSRD No. 5994. University of Michigan. November 1, 1945.

305 Ranging and Detection (IRRAD)

305.1 Night Surveying

M1 Night surveying by infrared, IRRAD. (Progress Report No. 16.4-36.) R. C. Mathes. OEMsr-1267; Service Project Nos. CE-22 and NR-103; OSRD No. 4850. Bell Telephone Laboratories, Inc. December 27, 1944.

M2 Night surveying by infrared, IRRAD. A supplement to Report No. 16.4-36, OSRD No. 4850. (Final Report No. 16.4-49.) R. C. Mathes. OEMsr-1267; Service Project Nos. CE-22 and NR-103; OSRD No. 5982. Bell Telephone Laboratories, Inc. July 27, 1945.

305.2 Range Finders

M1 Infrared range finder. (Special Report No. 16.4-16.) John D. Strong. OEMsr-60; Service Project No. NO-183. Harvard University. October 26, 1944.

M2 Infrared range finder. (Technical Report No. 16.4-42.) John D. Strong. OEMsr-60; Service Project No. NO-183. Harvard University. February 15, 1945.

M3 An infrared range and direction apparatus for diffusely reflecting targets, diffuse IRRAD. (Special Report No. 16.4-21, covering the period from May 1, 1944 to December 1, 1944.) W. L. Hole, W. W. McCormick and L. N. Holland. NDCrc-185; Service Project Nos. CE-22 and NR-103. University of Michigan. September 17, 1945.

310 Far Infrared

310.1 Radiation Transmission

M1 Infrared survey work at Harvard University. (Technical Report No. 16.4-26.) C. P. Butler. OEMsr-60; Service Project No. NS-163; OSRD No. 3559. Harvard University. April 12, 1944.

M2 Transmission of infrared radiation through atmospheric media. (Progress Report No. 16.4-27.) Harald H. Nielsen and Ely E. Bell. OEMsr-1168; Service Project No. AN-6; OSRD No. 3799. Ohio State University. May 31, 1944.

M3 Thermal radiation from targets and backgrounds. (Technical Report No. 16.4-44.) John D. Strong. OEMsr-60; Service Project No. NS-163; OSRD No. 5372. Harvard University. March 30, 1945.

310.2 Detection Devices

M1 Far infrared detecting devices. (First Progress Report No. 16.4-3.) E. L. Chaffee. OEMsr-60; OSRD No. 1157. Harvard University. December 31, 1942.

M2 Amplifier and control circuit development associated with far infrared apparatus. (Progress Report No. 16.4-4.) Alan C. Bemis and Henry G. Houghton. NDCrc-180; OSRD No. 1161. Massachusetts Institute of Technology. December 31, 1942.

M3 Sensitivities of infrared detectors. (Special Report No. 16.4-15.) John D. Strong. OEMsr-60; OSRD No. 2039. University of Michigan. September 14, 1943.

M4 Comparative testing of thermal detectors. (Final Report No. 16.4-58, covering the period [from] October 15, 1943 to October 31, 1945.) Harald H. Nielsen. OEMsr-1168; Service Project No. AN-6; OSRD No. 5992. Ohio State University. October 31, 1945.

310.21 Thermopiles and Thermocouples

M1 The Harris thermopile. (Special Report No. 16.4-29.) Harald H. Nielsen. OEMsr-1168. Ohio State University. May 14, 1945.

M2 Improved far infrared receivers and associated optics. (Final Report No. 16.4-41, covering the period [from] August 1, 1943 to February 28, 1945.) Alan C. Bemis. OEMsr-1147; Service Project Nos. AC-34, NS-157 and NS-161; OSRD No. 5299. Massachusetts Institute of Technology. July 10, 1945.

M3 [The] Eppley thermocouple. (Special Report No. 16.4-20.) Harald H. Nielsen. OEMsr-1168. [Ohio State University.] (n.d.)

310.22 Bolometers

310.221 Thermistors

M1 Thermistor bolometer and amplifier for infrared spectrometers. (Final Report No. 16.4-20.) J. A. Becker and H. Christensen. OEMsr-1098; OSRD No. 20. Bell Telephone Laboratories, Inc. June 2, 1944.

M2 The performance of the backed Becker bolometer. (Special Report No. 16.4-17.) Harald H. Nielsen. OEMsr-1168. [Ohio State University.] November 16, 1944.

M3 An assessment of scanning systems, amplifier circuits and indicator devices for use with the ther-

mistor bolometer. (Final Report No. 16.4-30.) S. Darlington and R. W. Buntenbach. OEMsr-636; Service Project No. NO-258; OSRD No. 4625. Bell Telephone Laboratories, Inc. December 7, 1944.

M4 The optical properties of thermistor material in the infrared. (Special Report No. 16.4-22.) A. H. Pfund. December 26, 1944.

M5 The Bell Telephone Laboratory bolometers. (Special Report No. 16.4-28.) Harald H. Nielsen. OEMsr-1168. Ohio State University. May 10, 1945.

M6 Infrared search and indicator units for drone control, Models A and B of the Type L system. (Final Report No. 16.4-55, covering the period from February 26, 1944 to October 31, 1945.) H. R. Moore. OEMsr-636; Service Project No. NA-172; OSRD No. 5989. Bell Telephone Laboratories, Inc. October 31, 1945.

M7 Development and operating characteristics of thermistor bolometers. (Final Report No. 16.4-57, covering the period [from] July 1, 1942 to October 31, 1945.) J. A. Becker, Walter H. Brattain and others. OEMsr-636; Service Project Nos. NS-161 and AC-225.01; OSRD No. 5991. Bell Telephone Laboratories, Inc. October 31, 1945.

310.222 Metal-Strip

M1 The Felix metal-strip bolometer. (Special Report No. 16.4-34.) Harald H. Nielsen. OEMsr-1168. Ohio State University. (n.d.)

310.223 Miscellaneous Bolometers

M1 The cryostat bolometer. (Special Report No. 16.4-35.) Harald H. Nielsen. OEMsr-1168. Ohio State University. August 15, 1945.

M2 Bolometer and infrared receiver components. (Final Report No. 16.4-47, covering the period from August 15, 1941 to November 30, 1945.) John D. Strong, Noel Jamison and Robert Mack. OEMsr-60; Service Project Nos. NS-121, N-108 and others; OSRD No. 5983. Harvard University. December 31, 1945.

310.23 Use of Detection Devices in Spectrometers

M1 Test of thermistor bolometer as receiver for National Technical Laboratories routine infrared spectrophotometer, January 4 to 13, 1944 [at] Ann Arbor, Michigan. (Report No. 16.4-24.) R. R. Brattain and O. Beeck. Shell Development Company. [January, 1944.]

M2 An investigation of the comparative merits of the thermistor-AC amplifier system and the thermocouple-galvanometer system. (Report No. 16.4-19.) L. W. Gildart. OEMsr-1132. University of Michigan. January 21, 1944.

M3 Spectrophotometric element, Type T, and amplifier for infrared spectrometers. (Final Report No. 16.4-29.) J. A. Becker and H. Cristensen. OEMsr-

1098. Bell Telephone Laboratories, Inc. July 17, 1944.

310.24 Golay Heat Detector

M1 Supplement to the memorandum on the Golay heat detector. (Special Report No. 16.4-33.) Harald H. Nielsen. OEMsr-1168. Ohio State University. July 15, 1945.

310.3 Military Uses of Far Infrared Thermal Detectors

310.31 Army Far Infrared Detectors

310.311 Portable NAN Detector (PND)

M1 Portable NAN detector or PND, Model 3. (Final Report No. 16.4-28.) J. A. Becker, Walter H. Brattain and others. OEMsr-636; OSRD No. 4168. Bell Telephone Laboratories, Inc. May 29, 1944.

310.312 Scanning NAN Detector (SND)

M1 SND-1 tests for Sphinx at Fort Knox, Kentucky, on July 9, 10 and 11, 1945. (Special Report No. 16.4-37.) J. A. Becker, Walter H. Brattain and N. G. Wade. OEMsr-636. [Bell Telephone Laboratories, Inc.] August 8, 1945.

M2 Flight tests of SND-1, June 27 to July 1, 1945. (Special Report No. 16.4-40.) Walter H. Brattain and N. G. Wade. OEMsr-636. [Bell Telephone Laboratories, Inc.] August 11, 1945.

M3 Development of the SND-1, scanning infrared detector. (Final Report No. 16.4-54, covering the period [from] June, 1944 to September, 1945.) Walter H. Brattain and N. G. Wade. OEMsr-636; Service Project Nos. CE-37 and AC-225.02; OSRD No. 5988. Bell Telephone Laboratories, Inc. and Western Electric Company, Inc. October 31, 1945.

310.313 Thermal Strip Mapper

M1 Ground tests of strip map recorder at Fort Knox, July 9 to 11, 1945. (Special Report No. 16.4-36.) L. M. Ilgenfritz. [Bell Telephone Laboratories, Inc.] August 4, 1945.

M2 Development of strip map recorder for target survey. (Final Report No. 16.4-56, covering the period [from] May, 1944 to October 31, 1945.) L. M. Ilgenfritz, R. W. Ketchledge and others. OEMsr-636; Service Project No. AC-225.02; OSRD No. 5990. Bell Telephone Laboratories, Inc. October 31, 1945.

310.32 Naval Far Infrared Detectors

310.321 Portable Ship Detector (PSD)

M1 The portable ship detector, PSD. (Final Report No. 16.4-50, covering the period from September, 1942 to November 30, 1945.) E. L. Chaffee. OEMsr-60; Service Project Nos. NS-121 and N-108; OSRD No. 5984. Harvard University. December 31, 1945.

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310.322 Stabilized Ship Detector (SSD)

- M1** [The] stabilized ship detector, SSD. (Final Report No. 16.4-51, covering the period from August, 1943 to November 30, 1945.) E. L. Chaffee. OEMsr-60; Service Project No. NS-181; OSRD No. 5985. Harvard University. December 31, 1945.
- M2** Stabilized ship detector tests on the *Marnell*, October 23 to November 3, 1944. (Special Report No. 16.4-25.) Noel C. Jamison. OEMsr-60; Service Project No. NS-181. Harvard University. February 12, 1945.

310.33 Foreign Models of Far Infrared Detectors

- M1** Detection of Navy Type E source by German Seehund. (Special Report No. 16.4-45.) Walter S. Huxford. OEMsr-990; Service Project Nos. SC-126, SC-128 and SC-129. Northwestern University. December 27, 1945.

320 Miscellaneous Infrared Research**320.1 Glider Position Indicator**

- M1** Development of an infrared glider position indicator. (Tentative draft. Special Report No. 16.4-5.) G. A. Van Lear, Jr. and L. N. Holland. NDCrc-185. University of Michigan. February 26, 1944.
- M2** Development of an infrared glider position indicator. (Final Report No. 16.4-31.) G. A. Van Lear, Jr. and L. N. Holland. NDCrc-185; Service Project No. AC-56. University of Michigan. January 11, 1945.

320.2 Atmospheric Attenuation

- M1** Preliminary development and tests of a retrodirective locator for the visible and near infrared. A method for the computation of threshold range as affected by instrumental thresholds and atmospheric attenuation. (Report No. 16.4-22, including as appendix Report No. 16.4-21, OSRD No. 3345.) W. L. Hole. NDCrc-185. University of Michigan. February 19, 1944.
- M2** Atmospheric attenuation of infrared radiation. (Preliminary Report I. Special Report No. 16.4-31.) John D. Strong. OEMsr-60; Service Project No. NO-183. Harvard University. May 29, 1945.
- M3** Cloud attenuation studies [at] Mount Washington, New Hampshire. (Final Report No. 16.4-71, covering the period from July, 1943 to August, 1944.) G. A. Van Lear, Jr. NDCrc-185; Service Project No. AC-56; OSRD No. 6201. University of Michigan. October 25, 1945.
- M4** Atmospheric attenuation of infrared radiations. (Final Report No. 16.4-52, covering the period from January 1, 1945 to November 30, 1945.) John D. Strong. OEMsr-60; Service Project No. AN-32; OSRD No. 5986. Harvard University. November 30, 1945.

320.3 Far Infrared Bombsight

- M1** An assessment of a far infrared bombsight with

angular rate release. (Special Report No. 16.4-18.) S. Darlington, R. W. Buntenbach and others. OEMsr-636; Service Project No. NO-258. Bell Telephone Laboratories, Inc. December 7, 1944.

320.4 Protective Coatings for Rock Salt and Silver Chloride

- M1** Protective coatings for rock salt plates and metallic mirrors. (Report No. 16.4-8.) A. H. Pfund. [OEMsr-610.] Johns Hopkins University. April 1, 1943.
- M2** Protective coatings for plates of rock salt and silver chloride. (Final Report No. 16.4-25.) A. H. Pfund. OEMsr-610. Johns Hopkins University. April 4, 1944.
- M3** A study of the transmission of silver chlorides from 1.0μ to 14.0μ . (Special Report No. 16.4-12.) Harald H. Nielsen and Alvin H. Nielsen. OEMsr-1168. [Ohio State University.] (n.d.)

400 IMAGE-FORMING INFRARED AND ULTRA-VIOLET**410 Survey of Sources****411 Infrared****411.1 Phosphors**

- M1** Development of infrared-sensitive phosphors. (Report No. 16.5-57 [covering period from] January 1, 1943 to August 31, 1943.) (n.a.) OEMsr-81; OSRD No. 3134. University of Rochester. August 31, 1943.
- M2** The preparation of infrared phosphors. (Report No. 16.5-56, covering the entire period . . . from March 1, 1943 to August 31, 1943.) (n.a.) OEMsr-982; OSRD No. 3140. Polytechnic Institute of Brooklyn. [September, 1943.]
- M3** Infrared stimulation of phosphors. (Final Report No. 16.5-114 [covering period] from August 1, 1943 to June 30, 1945.) N. F. Miller. OEMsr-740; Service Project Nos. CE-11 and NS-172; OSRD No. 5360. New Jersey Zinc Company. June, 1945.
- M4** The preparation of infrared phosphors. (Progress Report No. 16.5-119, covering the period [from] September 1, 1943 to August 31, 1945.) Roland Ward. OEMsr-982; Service Project No. NS-172; OSRD No. 5643. Polytechnic Institute of Brooklyn. September 1, 1945.
- M5** Phosphors. (Final Report No. 16.5-125.) (n.a.) OEMsr-81; Service Project Nos. CE-11, NS-172 and NS-282; OSRD No. 5655. University of Rochester. September 24, 1945.

411.11 Zinc Sulfide Phosphors

- M1** Preparation of stimulated zinc sulfide phosphors. Report II, Characteristics. (Progress Report No. 16.5-70.) G. R. Fonda. OSRD No. 3371. General Electric Company. December 7, 1943.
- M2** Survey of zinc sulfide phosphors capable of stimulation. (Progress Report No. 16.5-84.) G. R. Fonda.

OEMsr-1155; OSRD No. 3947. General Electric Company. July 7, 1944.

- M3** Stimulation and phosphorescence of zinc sulfide phosphors. (Progress Report No. 16.5-99.) G. R. Fonda. OEMsr-1155; OSRD No. 4587. General Electric Company. December 2, 1944.

- M4** Preparation and characteristics of zinc sulfide phosphors stimulated by infrared. (Final Report No. 16.5-111.) G. R. Fonda. OEMsr-1155; Service Project No. NS-172; OSRD No. 5377. General Electric Company. July 20, 1945.

412 Ultraviolet

- M1** Development of an invisible ultraviolet light source. (Progress Report No. 16.5-78.) (n.a.) OEMsr-1073. University of California. March 1, 1944.

420 Infrared and Ultraviolet Devices and Equipment

- M1** Special optical devices. (Final Report No. 16.5-126.) (n.a.) OEMsr-1219; Service Project Nos. AC-225, NS-172 and others; OSRD No. 5656. University of Rochester. November 1, 1945.

421 Telescopes

- M1** Development of infrared telescope. (G. A. Morton.) Research Project No. PDRC-269; OSRD No. 744. Radio Corporation of America. June 22, 1942.

- M2** Evaluation of the ultraviolet telescope. (Progress Report No. 16.5-51 [covering period] from May 7, 1943 to October 27, 1943.) L. J. Reimert. OEMsr-740. New Jersey Zinc Company. [October, 1943.]

- M3** Infrared image tubes and electron telescopes. (Final Report No. 16.5-123.) G. A. Morton. OEMsr-440; Service Project Nos. CE-34, NS-172 and others; OSRD No. 5653. Radio Corporation of America. November 30, 1945.

421.1 Electron Telescopes (Image Tubes)

421.11 Head-Mounted Image Tubes

- M1** Headmounts for infrared telescopes for aircraft and vehicle use. (Progress Report No. 16.5-68.) (n.a.) OEMsr-1075; OSRD No. 3310. University of Pennsylvania. February 15, 1944.

- M2** The development of a head-mounted infrared binocular telescope for vehicle driving and for landing airplanes. (Final Report No. 16.5-124.) D. W. Bronk, H. K. Hartline and others. OEMsr-1075; Service Project No. CE-34; OSRD No. 5654. University of Pennsylvania. September 30, 1945.

421.2 Metascopes

- M1** Development of infrared telescopes utilizing infrared-sensitive phosphors. (Report No. 16.5-55 [as of] June 15, 1943.) (n.a.) OEMsr-81 and OEMsr-510; OSRD No. 3129. University of Rochester. June 15, 1943.

- M2** Metascopes. (Progress Report No. 16.5-73.) Joseph Mihalyi. OEMsr-1100; Problem No. DD-2510C; OSRD No. 3400. Eastman Kodak Company. September 22, 1943.

- M3** Outline of metascope infrared telescope development. (Report No. 16.5-22.) (n.a.) OEMsr-81 and OEMsr-510. University of Rochester. (n.d.)

421.21 Kellner-Schmidt Optical System

- M1** Development of Kellner-Schmidt optical systems. ([Parts] I and II. Interim Report Nos. 16.5-16 and 16.5-17.) (n.a.) OEMsr-510. University of Rochester. June 30, 1943.

- M2** Wide-aperture Kellner-Schmidt optical systems. (Progress Report No. 16.5-24.) (n.a.) OEMsr-510. [University of Rochester.] August 15, 1943.

421.22 Type B

- M1** Development of optical device, Type B, formerly metascope, Model B. (Progress Report No. 16.5-76 [covering period from] June 8, 1943 to February 1, 1944.) (n.a.) OEMsr-1100; Problem No. 25.10-C; OSRD No. 3408. Eastman Kodak Company. [February, 1944.]

421.23 Type F

- M1** The Type F metascope. (Report No. 16.5-65.) (n.a.) OEMsr-81 and OEMsr-510; OSRD No. 3266. University of Rochester. January 1, 1944.

422 Auto-Collimating Units

- M1** Schmidt auto-collimator unit. [Part] I, Molds. [Part] II, Auto-collimator units. (Report No. 16.5-60.) (n.a.) OEMsr-495; OSRD No. 3136. Bausch and Lomb Optical Company. December 10, 1943.

- M2** Schmidt auto-collimator units. (Final Report No. 16.5-107.) (n.a.) OEMsr-495; Service Project No. CE-11; OSRD No. 5158. Bausch and Lomb Optical Company. June 30, 1945.

- M3** Metaflectors. (Final Report No. 16.5-130.) (n.a.) OEMsr-1000; Service Project Nos. AC-225, NS-172 and others; OSRD No. 6213. University of Rochester. October 4, 1945.

422.1 Auto-Collimator Buttons and Lenses

- M1** Auto-collimator buttons. (Progress Report No. 16.5-64, covering period [from] July 1, 1943 to December 1, 1943.) R. A. Woodson. OEMsr-994; OSRD No. 3370. Eastman Kodak Company. December 13, 1943.

- M2** The manufacture of auto-collimating lens units. (Final Progress Report No. 16.5-87.) (n.a.) OEMsr-932; OSRD No. 3948. Rochester Button Company. July 18, 1944.

- M3** Fluorescent retrodirectional auto-collimating buttons. (Final Report No. 16.5-96, covering period [from] December 1, 1943 to August 31, 1944.) Reginald T. Lamb and John H. McLeod. OEMsr-

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- 994; OSRD No. 4318. Eastman Kodak Company. September 27, 1944.
- 422.2 Visibility of Ultraviolet Light Sources**
- M1** [Visibility of ultraviolet light sources and ranges of auto-collimating reflectors.] (Report No. 16.5-44.) (n.a.) University of Rochester. March 30, 1943.
- M2** Visibility of ultraviolet light sources and ranges of fluorescent retrodirectional auto-collimating devices. (Progress Report No. 16.5-44 [covering period] from March 12 to April 12, 1943.) L. J. Reimert. OEMsr-740. New Jersey Zinc Company. April 13, 1943.
- 422.3 Triple Mirrors**
- M1** Methods of making triple mirrors. (First Progress Report, No. 16.5-52 and Second Progress Report, No. 16.5-53 [covering the period from] August 1, 1942 to March 31, 1943.) Theodore Dunham, Jr., Walter S. Adams and others. OEMsr-698; OSRD Nos. 3138 and 3139. Mount Wilson Observatory.
- M2** Triple mirrors. (Final Report No. 16.5-110.) W. V. Penfold. OEMsr-1319. Penn Optical and Instrument Company. June 1, 1945.
- M3** The manufacture of trihedral (triple mirror) prisms. (Final Report No. 16.5-122.) (n.a.) OEMsr-698; Service Project No. AC-65; OSRD No. 5652. Mount Wilson Observatory. September 30, 1945.
- 423 Sun-Obscuring Devices**
- M1** The development of a sight in which the solar glare is eliminated. (Progress Report No. 16.5-39.) Donald H. Menzel. December 31, 1942.
- M2** Telescope shutter, sun-obscuring device. (Progress Report No. 16.5-75.) C. M. Tuttle. OEMsr-996; Problem No. DD-2528; OSRD No. 3404. Eastman Kodak Company. February 14, 1944.
- M3** An investigation of sun-occluding devices. (Final Report No. 16.5-90.) James R. Balsley and Harlow Shapley. OEMsr-571; OSRD No. 4097. Harvard University. July 3, 1944.
- M4** Gradient density sun glasses. (Final Report No. 16.5-109.) (n.a.) OEMsr-989; Service Project No. QMC-37; OSRD No. 5177. Bausch and Lomb Optical Company. November 15, 1945.
- 424 Radiation Filters**
- M1** A special radiation filter opaque to the eye, transmissive for waves shorter than 3000 angstroms. (Progress Report No. 16.5-93.) C. G. Abbot and L. B. Aldrich. OEMsr-1015; OSRD No. 4169. Smithsonian Institute. (n.d.)
- 425 Blackout Driving Lights**
- M1** A blackout driving light. ([Part] II. Report No. 16.5-12.) (n.a.) OEMsr-683. University of Rochester. February 1, 1943.
- 430 Tactical Applications**
- M1** [Tactical infrared applications.] Activities under Contract OEMsr-423. (Final Report No. 16.5-127.) G. E. Meese. OEMsr-423; Service Project Nos. AC-226, CE-34 and NA-175; OSRD No. 5651. General Electric Company. September 25, 1945.
- 431 Blackout Driving**
- M1** Infrared equipment for night operation of tanks. (Progress Report No. 16.5-9, as of September 4, 1942.) V. J. Roper and G. E. Meese. OEMsr-423; Research Project No. PDRC-403. General Electric Company. September 4, 1942.
- 431.1 Infrared**
- M1** Night driving by means of infrared telescopes. ([Part] I.) G. A. Morton. OEMsr-440; OSRD No. 1909. Radio Corporation of America. July, 1943.
- M2** Application of infrared radiation in gun ranging and vehicle driving under cover of darkness. Field trials conducted at Princeton, New Jersey, on March 27 and at Fort Knox, Kentucky, April 13 and 14, 1943. (Interim Report No. 16.5-47.) G. E. Meese. OEMsr-423; Research Project No. PDRC-403. General Electric Company. August 17, 1943.
- 431.2 Ultraviolet**
- M1** Blackout driving, ultraviolet system, as demonstrated at Palmerton, Pa., on September 27, 1943. (Report No. 16.5-61 [covering period] from July 1 to October 1, 1943.) (n.a.) OEMsr-740 and OEMsr-423; OSRD No. 3208. New Jersey Zinc Company and General Electric Company. December, 1943.
- M2** Road delineation and nocturnal vehicular driving with ultraviolet radiation. (Progress Report No. 16.5-86.) G. E. Meese. OEMsr-423; Research Project No. PDRC-403; OSRD No. 3945. General Electric Company. April 18, 1944.
- 431.3 Red Headlights**
- M1** Driving test of red headlights. (Progress Report No. 16.5-69.) (n.a.) [OEM]cmr-209; OSRD No. 3336. University of Pennsylvania. (n.d.)
- 432 Railroad Operation**
- M1** Application of infrared radiation in the operation of railway locomotives under blackout conditions. Field trials conducted on the evenings of June 3 and June 10, 1943 at the Locomotive Test Track of the Erie Works . . . Erie, Pa. (Division 12. Report No. 165-72-825E.) G. E. Meese. OEMsr-423; Research Project No. PDRC-403; OSRD No. 2033. General Electric Company. July 23, 1943.
- M2** Application of infrared radiation in the operation of railway locomotives under blackout conditions. Field trials conducted on the evenings of October 2, 3, 4 and 23, 1943 at Camp Claiborne, Louisiana. (Supplementary Report No. 16.5-66.) G. E. Meese.

OEMsr-423; Research Project No. PDRC-403; OSRD No. 3319. General Electric Company. February 2, 1944.

- M3** Application of infrared radiation in the operation of railway locomotives under blackout conditions. Demonstration to representatives of the Transportation Corps, US Army, at the Engineer Board, February 22, 1944. (Supplementary Report No. 16.5-85.) G. E. Meese. OEMsr-423; Research Project No. PDRC-403; OSRD No. 3946. General Electric Company. June 30, 1944.

433 Aircraft Operation

- M1** Application of infrared telescopes to glider and airplane operation. (Part III.) G. A. Morton. OEMsr-440; OSRD No. 1877. Radio Corporation of America. July, 1943.

433.1 Night Landing of Aircraft

- M1** A system for night landing of aircraft under conditions of blackout and radio silence. (n.a.) OEMsr-69; OSRD No. 741. University of Rochester. July 24, 1942.
- M2** A demonstration test of the Institute of Optics night landing system at Wright Field. (Supplementary Report to OSRD No. 741.) (n.a.) OEMsr-69. University of Rochester. August 10, 1942.
- M3** Aircraft night landing. (Part IV, Visual light supplement. (n.a.) OEMsr-69. University of Rochester. February 1, 1943.
- M4** Aircraft night landing. (Part III . . . a demonstration of night landing equipment, held at the Naval Air Station, Norfolk, Va. (on) September 17, 1942. (Interim Report No. 16.5-36.) (n.a.) OEMsr-69; OSRD No. 1596. University of Rochester. June 30, 1943.
- M5** Night landing of aircraft with infrared radiation. Demonstration at Lancaster, Pa. (on) June 7, 1944. (Interim Report No. 16.5-103.) G. E. Meese. OEMsr-423; OSRD No. 4945. General Electric Company. (June, 1944.)
- M6** Use of head-mounted infrared binoculars in the landing of aircraft. (Progress Report No. 16.5-91.) (n.a.) OEMsr-1075; OSRD No. 4092. University of Pennsylvania. August 18, 1944.
- M7** Night landing of aircraft with NAN markers. Tests at NAAF, Charlestown, R. I., May 12 (to) June 14, 1945. (Final Report No. 16.5-118.) C. L. Amick and G. E. Meese. OEMsr-423; Service Project Nos. CE-34 and NA-175; OSRD No. 5564. General Electric Company. September 7, 1945.

433.2 Airborne Beacon

- M1** Infrared radiation as an aid in nocturnal airborne operations. Three chronological reports covering development of the airborne beacon. (Progress Report No. 16.5-120.) G. E. Meese. OEMsr-423; Service Project Nos. CE-34 and NA-175; OSRD No. 5650. General Electric Company. September 5, 1945.

434 Amphibious Operation

434.1 Night Landing

- M1** A field demonstration held for the benefit of the Amphibious Forces in the vicinity of Solomon's Island, Virginia. Field demonstration of special equipment for night landing operations. (Report No. 16.5-10.) (n.a.) OEMsr-427. University of Rochester. (August (?) 1942.)
- M2** Night landing operations with the aid of infrared lights and viewing equipment. (G. A. Morton.) Research Project No. PDRC-269; OSRD No. 1046-C. Radio Corporation of America. November, 1942.
- M3** The application of infrared equipment to night amphibious operations. Part I, Field demonstration in the vicinity of Fort Story, Virginia, on the night of February 7, 1943. Part II, Field demonstration at Camp Edwards, Massachusetts, on the night of February 23, 1943. (Division 12. Report No. 165-72-824E.) G. E. Meese. OEMsr-423; Research Project No. PDRC-403; OSRD No. 2017. General Electric Company. April 16, 1943.

434.2 Reconnaissance

(See also: 460)

- M1** Nocturnal shoreline reconnaissance with infrared radiation. Tests at Cape Henlopen, Delaware, March 16 and 17, 1945 (and at) Fort Pierce, Florida, April 14 to 20, 1945. (Progress Report No. 16.5-113.) C. L. Amick and G. E. Meese. OEMsr-423; Service Project Nos. AC-226, CE-34 and NA-175; OSRD No. 5376. General Electric Company. August 15, 1945.

440 Identification Systems

- M1** Infrared identification systems using electron telescopes. G. A. Morton. OEMsr-440; OSRD No. 1910. Radio Corporation of America. July, 1943.

441 Surface Vessel Identification from Air

- M1** A visual method for the identification of surface vessels from aircraft. Field demonstration (at) Langley Field, Virginia, and Norfolk, Virginia, September 19 to October 6, 1942. (n.a.) OSRD No. 985. University of Rochester. (October, 1942.)
- M2** Air (to) surface vessel identification system. (Part II. Report No. 16.5-13.) (n.a.) OEMsr-725; OSRD No. 1598. University of Rochester. March 1, 1943.
- M3** Air (to) surface vessel identification system. (Part III, Special equipment developed for identification of surface vessels from the air. (Report No. 16.5-14.) (n.a.) OEMsr-725. University of Rochester. March 1, 1943.
- M4** Air (to) surface vessel identification system. (Part IV, The identification of surface vessels from aircraft equipped with linked searchlights and anti-oscillation mounted binoculars. (Report No. 16.5-

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59.) (n.a.) OEMsr-725; OSRD No. 3128. University of Rochester. October 15, 1943.

450 Communication

M1 Communication by non-visible ultraviolet radiation. (Final Report No. 16.5-112.) Harvey E. White. OEMsr-1073; Service Project Nos. NS-370 and NS-371; OSRD No. 5378. University of California. October 15, 1945.

460 Reconnaissance

(See also: 434.2)

M1 Reconnaissance and observation of extended objects with infrared telescopes. (Progress Report No. V.) G. A. Morton. OEMsr-440; OSRD No.

1854. Radio Corporation of America. August, 1943.

M2 Trial of infrared devices in the detection of hidden Japanese defenses. [Tests at] Fort Knox, Kentucky [on] July 9, 10 and 11, 1945. (Progress Report No. 16.5-121.) G. E. Meese. OEMsr-423; Service Project Nos. CE-34 and NA-175; OSRD No. 5920. General Electric Company. September 17, 1945.

470 Miscellaneous Research

M1 Visual thresholds at low brightnesses. (Final Report No. 16.5-79 [covering period] from March 1 to October 6, 1943.) L. J. Reimert. OEMsr-740. New Jersey Zinc Company. October 12, 1943.

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- M1 [Metallic mine problems.] (Progress Report for the month of May, 1943.) [S. A. Scherbatskoy.] Research Project No. 2503. June 10, 1943.
- 111.11 **Detectors**
- M1 Portable iron detector. F. Wenner, R. J. Duffin and J. L. Dalke. OEMsr-151; Service Project No. OD-46; OSRD No. 4659. Carnegie Institution of Washington. January 15, 1945.
- 111.2 **Non-Metallic**
- M1 Seismic and nuclear methods for [locating non-metallic land mines]. S. A. Scherbatskoy. [OEMsr-958;] Research Project No. 2503. April 30 and May 10, 1943.
- M2 Detection of non-metallic mines by radioactivity methods. Gerhard Herzog. OEMsr-1114; OSRD No. 3158. The Texas Company. December 30, 1943.
- M3 The location of non-metallic land mines by the use of high-frequency oscillations. L. G. Ellis, R. L. Henson and others. OEMsr-998; OSRD No. 3089. Sun Oil Company. February 15, 1944.
- M4 The location of non-metallic land mines by the use of vibrational devices [such as] the resonant method [and] the diffraction method. L. G. Ellis, R. L. Henson and others. OEMsr-998; OSRD No. 3090. Sun Oil Company. February 15, 1944.
- M5 Detection of land mines. A. H. Kettler, R. E. Swain and others. OEMsr-1061; OSRD No. 4017. Radio Corporation of America. March 15, 1944.
- M6 Marking of friendly mines, lanes and booby-traps by radioactivity, Mamie. Tests of radioactivity methods for locating unmarked enemy mines, Dinah. ([Parts] A and B.) Robley D. Evans, Sanborn C. Brown and John W. Irvine, Jr. OEMsr-1156; OSRD No. 3679. Massachusetts Institute of Technology. April 10, 1944.
- M7 Investigation of a method of non-magnetic mine detection based on the well-logger. Joseph Razek and H. W. Ashton. OEMsr-998; OSRD No. 4237. October 15, 1944.
- M8 Mine detection method proposed by Virgil Brittain. Joseph Razek and H. W. Ashton. OEMsr-998; OSRD No. 4238. October 15, 1944.
- M9 Detection of land mines. W. J. Morlock, E. S. Lundie and others. OEMsr-1061; OSRD No. 4605. Radio Corporation of America. November 15, 1944.
- M10 Detection of small foreign bodies imbedded in the top soil by low-frequency alternating current. Haakon M. Evjen and W. V. Mills. OEMsr-1470; OSRD No. 5677. Elflex Company. September 28, 1945.
- M11 Detection of land mines. E. S. Lundie, H. J. Woll and others. OEMsr-1061; OSRD No. 5721. Radio Corporation of America. October 31, 1945.
- M12 Investigations of microwave means for the detection of land mines. George B. Hoadley and Charles A. Hachemeister. OEMsr-1374; OSRD No. 5718. Polytechnic Institute of Brooklyn. October 31, 1945.
- 111.21 **Detectors**
- M1 Electromechanical type of detector for the detection of non-metallic land mines. E. A. Eckhardt. OEMsr-998 and OEMsr-1061; OSRD No. 3396. Sun Oil Company and Radio Corporation of America. March 15, 1944.
- M2 Non-metallic mine detector. H. G. Doll, Charles B. Aiken and O. H. Huston. OEMsr-1063; OSRD No. 4614. Electro-Mechanical Research, Inc. December 22, 1944.
- 111.3 **Metallic and Non-Metallic**
- M1 Detection of land mines by radio frequency methods. A. A. Barco, F. C. Gow and others. OEMsr-1061; Service Project No. CE-31; OSRD No. 4998. Radio Corporation of America. March 30, 1945.
- M2 Location of land mines through electromagnetic methods. C. H. Fay. OEMsr-1463; OSRD No. 5719. Shell Oil Company, Inc. October 31, 1945.
- 111.31 **Detectors**
- M1 Mine detector, SW-7, for both metallic and non-metallic land mines. H. G. Doll. Electro-Mechanical Research, Inc. July 19, 1944.
- 112 **Antitank Mines**
- M1 Location of antitank mines. ([Parts] I through IV. Report Nos. 1191-W to 1194-W.) L. F. Curtis. Hazeltine Service Corporation. March 11 to 14, 1941.
- M2 Location of antitank mines. [Part] V, Coil arrangement for detecting metal bodies in induction fields. (Report No. 1198-W.) L. F. Curtis. Hazeltine Service Corporation. April 29, 1941.
- M3 Location of antitank mines. [Part] VI, Differential electromagnetometer. Theory and design considerations. (Report No. 1207-W.) Rudolf C. Hergen-

- rother. Hazeltine Service Corporation. May 28, 1941.
- M4** Location of antitank mines. [Part] VII, Progress report [for] June 1, 1941. (Report No. 1208-W.) L. F. Curtis. NDCrc-95. Hazeltine Service Corporation. May 28, 1941.
- M5** Location of antitank mines. [Part] VIII, The effect of the ground on a nearby coil. (Report No. 1218-W.) H. A. Wheeler. Hazeltine Service Corporation. June 19, 1941.
- M6** Location of antitank mines. [Part] IX, Locator using amplified frequency variation. (Report No. 1223-W.) L. F. Curtis. Hazeltine Service Corporation. July 28, 1941.
- M7** Location of antitank mines. [Part] X, The relative advantages of certain features. (Report No. 1229-W.) H. A. Wheeler. Hazeltine Service Corporation. August 5, 1941.
- M8** Location of antitank mines. [Part] XI, The properties of spherical coils and objects. (Report No. 1230-W.) H. A. Wheeler. Hazeltine Service Corporation. August 8, 1941.
- M9** Location of antitank mines. [Part] XII, Differential electromagnetometer, [a] developmental model. (Report No. 1236-W.) Rudolf C. Hergenrother. Hazeltine Service Corporation. August 20, 1941.
- M10** Location of antitank mines. [Part] XIII, Scale model for determining the effects of conducting bodies and conducting media in induction fields. (Report No. 1235-W.) D. E. Blanchard. Hazeltine Service Corporation. August 20, 1941.
- M11** Location of antitank mines. [Part] XIV, Relative response to nearby objects and ground. (Report No. 1237-W.) H. A. Wheeler. Hazeltine Service Corporation. August 21, 1941.
- M12** Location of antitank mines. [Part] XV, Theory of the scale model. (Report No. 1238-W.) H. A. Wheeler. Hazeltine Service Corporation. August 22, 1941.
- M13** Location of antitank mines. [Part] XVI, Tests of locator using amplified frequency variation. (Report No. 1239-W.) T. C. Hana. Hazeltine Service Corporation. August 28, 1941.
- M14** Location of antitank mines. [Part] XVII, Interpretation of tests on scale model. (Report No. 1241-W.) H. A. Wheeler. Hazeltine Service Corporation. August 28, 1941.
- M15** Location of antitank mines. [Part] XVIII, Summary [to] August 30, 1941. (Report No. 1242-W.) L. F. Curtis. NDCrc-95. Hazeltine Service Corporation. August 29, 1941.
- M16** Location of antitank mines. [Part] XIX, Hazeltine Model 3 locator. (Report No. 1254-W.) L. F. Curtis. NDCrc-95. Hazeltine Service Corporation. October 4, 1941.
- M17** [The development of portable equipment for the location of antitank mines,] Job 239. (Report Nos. 1261-W, 1262-W, 1266-W, 1271-W, 1273-W, 1294-W and 1298-W.) L. F. Curtis, J. J. Okren and others. Hazeltine Service Corporation. November 26, 28, December 8, 29, 1941 and February 6, April 29 and May 7, 1942.
- 120 Mine Clearance and Mine Firing Devices**
- 121 Types Used Against Enemy Mines**
- 121.1 Rotaflail**
- M1** Two types of mechanical mine exploders. (AMP Memorandum No. 69.1.) L. J. Savage and W. Praeger. AMG-Brown University. October 9, 1943.
- M2** Model study of the rotaflail. B. R. Teare, Jr. OEMsr-1234; OSRD No. 3023. Carnegie Institute of Technology. December 27, 1943.
- M3** Model study of the rotaflail. (Second report.) W. Caywood. OEMsr-3765; OSRD No. 4197. Carnegie Institute of Technology. November 1, 1944.
- M4** Model study of the rotaflail. (Final report.) W. Caywood. OEMsr-1234; OSRD No. 5165. Carnegie Institute of Technology. June 5, 1945.
- 121.2 Amphibious Snake**
- M1** Developments related to the amphibious Snake. Thomas Bardeen. OEMsr-266; OSRD No. 5673. Gulf Research and Development Company. October 15, 1945.
- 121.3 Projected Line Charge**
- M1** Firing device for the projected line charge. Thomas Bardeen. OEMsr-266; OSRD No. 6077. Gulf Research and Development Company. October 15, 1945.
- 122 Research Mine Clearance and Detonation**
- 122.1 Shock Impulse**
- M1** A study of the dynamic characteristics of antitank mines and the development of indicator mines. Thomas Bardeen and A. P. Palmer. OEMsr-266; OSRD No. 3884. Gulf Research and Development Company. June 1, 1944.
- M2** Effect of blast on indicator mines. E. Bright Wilson, Jr., A. H. Taub and others. OEMsr-266; Service Project No. OD-03; OSRD No. 4276. Gulf Research and Development Company, Princeton University and Stanolind Oil and Gas Company. September 28, 1944.
- M3** The effect of shock impulse on antitank mines. (Part I.) Thomas Bardeen. OEMsr-266; OSRD No. 6078. Gulf Research and Development Company. October 15, 1945.
- M4** The effect of shock impulse on antitank mines. Part II, Appendices. Thomas Bardeen. OEMsr-266; OSRD No. 6078. Gulf Research and Development Company. October 15, 1945.
- 122.2 Magnetic Fields**
- M1** Magnetic fields of tanks and other vehicles. A. G.

McNish, Bryant Tuckerman and others. OEMsr-151; Service Project No. OD-46; OSRD No. 4734. Carnegie Institution of Washington. February 28, 1945.

- M2** [Magnetic fields of vehicles, firing device and detectors.] Final report on Contract OEMsr-151 and supplements. J. A. Fleming and A. G. McNish. OEMsr-151; OSRD No. 4809. Carnegie Institution of Washington. March 15, 1945.

123 Land Mine Firing Devices

- M1** Magnetic firing device. F. Wenner and A. G. McNish. OEMsr-151; OSRD No. 4705. Carnegie Institution of Washington. February 28, 1945.
- M2** Magnetic detector for firing antitank mines. Gary Muffly and L. E. Smith. OEMsr-266; OSRD No. 5671. Gulf Research and Development Company. October 1, 1945.

130 Mine Types and Their Control

131 Magnetic Mines for Land and Sea

- M1** Studies on investigations related to the development of detecting devices for magnetic mines. (Progress Report Nos. 146, 168, 182, 240, 276, 277 and 346.) Gary Muffly. OEMsr-95. Gulf Research and Development Company. September 1, November 1, 1941; January 2, March 2, May 1, July 1, September 1 and November 1, 1942.

131.1 Magnetometers

- M1** Magnetometers and magnetic gradiometers. Vaughn L. Agy, J. L. Dalke and others. OEMsr-151; OSRD No. 3339. Carnegie Institution of Washington. February 28, 1945.

132 Submarine Mines

132.1 Control Systems

132.11 Magnetic (Shore Control)

- M1** Control system for submarine mines. (Progress Report No. 82.) Alfred B. Miller and Willard P. Place. NDCrc-81; Research Project No. D3-51P2. Union Switch and Signal Company. July 29, 1941.
- M2** Control system for submarine mines. (Progress Report No. 184.) L. O. Grondahl. NDCrc-81. Union Switch and Signal Company. February 11, 1942.
- M3** Control system for submarine mines. (Progress Report No. 333.) L. O. Grondahl, Willard P. Place and Alfred B. Miller. OEMsr-328. Union Switch and Signal Company. November 17, 1942.
- M4** Control system for submarine mines. (Final Report covering the period from January 15, 1942 to June 30, 1943.) (n.a.) OEMsr-328. Union Switch and Signal Company. July 23, 1943.
- M5** Magnetic-influence ground mine detector and related indicating and firing equipment. Gary Muffly. OEMsr-266; OSRD No. 1557. Gulf Research and Development Company. September 15, 1943.

- M6** Magnetic-influence underwater ground mines. [The] development of detecting and control devices. (n.a.) OEMsr-266 and OEMsr-328; Service Project Nos. OD-69 and OD-72; OSRD No. 1999. Gulf Research and Development Company and Union Switch and Signal Company. December 10, 1943.

132.111 Firing Devices

- M1** Detecting and firing device for magnetic-influence ground mines. Gary Muffly. OEMsr-266; OSRD No. 1463. Gulf Research and Development Company. January 1, 1943.
- M2** Detecting and firing device for magnetic-influence ground mines. Gary Muffly. OEMsr-266; OSRD No. 1464. Gulf Research and Development Company. March 1, 1943.

132.12 Acoustic

- M1** Design of acoustical-controlled ground mine. (n.a.) [OEMsr-47;] MIT Research Project DIC-6015. Massachusetts Institute of Technology. October 29, 1941.
- M2** Design of acoustical-controlled ground mines. (n.a.) MIT Research Project DIC-6015. Massachusetts Institute of Technology. December 27, 1941.
- M3** [A design of an acoustical control in the new Army controlled ground mines.] (Progress Report Nos. 179 and 202.) (n.a.) MIT Research Project DIC-6033. Massachusetts Institute of Technology. February 6 and March 30, 1942.
- M4** Recent tests on a Model TH-2 microphone. (Supplementary Progress Report No. 219.) (n.a.) OEMsr-47; MIT Research Project DIC-6015. Massachusetts Institute of Technology. May 16, 1942.
- M5** Acoustic echo device and other acoustic detectors for controlled submarine mines. (Progress Report No. 306.) (n.a.) OEMsr-295; MIT Research Project DIC-6033. Massachusetts Institute of Technology. September 31, 1942.
- M6** A listening-type acoustical firing unit for controlled mine warfare, Type T-5E18. (Supplement included.) Cyril M. Harris. OEMsr-295; MIT Research Project DIC-6033; OSRD No. 1629. Massachusetts Institute of Technology. June 24 and September 1, 1943.

200 MISCELLANEOUS DETECTION PROBLEMS

210 Gas Detection

- M1** Gas detection and analysis. (Progress Report No. 84.) A. H. Pfund. [Johns Hopkins University.] July 31, 1941.
- M2** Gas analysis contract. (Progress Reports for [January,] August, 1942 and April, 1943.) William G.

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- Fastie and A. H. Pfund. [Johns Hopkins University.]
- M3** Infrared gas detector and gas analyzer. (n.a.) OEMsr-178 and OEMsr-1035; OSRD No. 1642. Johns Hopkins University and Leeds and Northrup Company. January 1, 1944.
- M4** Selective gas analyzers. J. R. Stewart. OEMsr-1035; OSRD No. 5004. Leeds and Northrup Company. May 31, 1945.
- M5** Selective infrared gas analyzers. William G. Fastie and C. Wilbur Peters. OEMsr-178; OSRD No. 5674. Johns Hopkins University. October 31, 1945.
- 220 Particle and Mass Detection**
- 221 Plastic and Metal Particles in Human Body**
- M1** The construction of an improved metallic object locator. (Progress Report No. 312.) W. E. Gilson. University of Wisconsin. November 6, 1942.
- M2** An improved locator. W. E. Gilson. [OSRD No. 1235.] University of Wisconsin. [March, 1943.]
- M3** Gilson's surgeon's metal locator. R. H. Maxson. OEMsr-1401. Burdick Corporation. May 22, 1945.
- M4** Study of methods for the detection of plastic particles in human bodies. Robley D. Evans, Sanborn C. Brown and John W. Irvine, Jr. OEMsr-1489; OSRD No. 5678. Massachusetts Institute of Technology. September 29, 1945.
- 222 Unexploded Bombs**
- M1** Location of unexploded aerial bombs. ([Parts] I to III. Report Nos. RP-1, RP-2 and RP-6.) F. M. Floyd. Kannenstine Laboratories. November 7, 1942, March 1 and June 16, 1943.
- M2** Investigation of the possibility of locating buried bombs by electrical surveys. (Report No. RP-3.) C. H. Fay. Kannenstine Laboratories. March 3, 1943.
- M3** A theoretical investigation of the problem of unexploded bomb detection by thermal means. (Report No. RP-4.) C. H. Fay. Kannenstine Laboratories. March 17, 1943.
- M4** [Problem of locating unexploded bombs by various geophysical methods.] F. M. Kannenstine. Kannenstine Laboratories. March 22, 1943.
- 222.1 Gradiometers**
- M1** A magnetic gradiometer for unexploded bomb location. (Report No. RP-5.) C. H. Fay. Kannenstine Laboratories. March 31, 1943.
- M2** A second vertical-vertical magnetic gradiometer for unexploded bomb location. (Report No. RP-7.) (n.a.) OEMsr-749. Kannenstine Laboratories. January 24, 1944.
- M3** A vertical-horizontal gradiometer for unexploded bomb location by measurements in boreholes. (Report No. RP-8.) (n.a.) OEMsr-749. Kannenstine Laboratories. January 24, 1944.
- 223 Firearms Carried on the Person**
- M1** Development of a magnetic mass-detecting security device. (Progress Reports [covering the period from] September 1, 1942 to September 1, 1943.) Gary Muffly and L. E. Smith. OEMsr-266. Gulf Research and Development Company.
- M2** Electromagnetic mass-detecting security device. Gary Muffly and L. E. Smith. OEMsr-266; OSRD No. 5330. Gulf Research and Development Company. July 21, 1945.
- 300 FRONT LINE INSTRUMENTATION**
- 310 Compasses**
- M1** [Development and test of magnetic compasses and odographs in vehicles.] (Progress Report for the period [from] June 30, 1942 to February 28, 1943.) James M. Barry, Bryant Tuckerman and others. NDCrc-187; OSRD No. 1398. Carnegie Institution of Washington. February 28, 1943.
- M2** [Magnetic compasses and odographs.] Final report on Contract NDCrc-187 and supplements. J. A. Fleming and A. G. McNish. NDCrc-187; OSRD No. 4997. Carnegie Institution of Washington. April 27, 1945.
- M3** Letter to William H. Crew. Subject: [Magnetic compasses.] Memorandum on work conducted at the Department of Terrestrial Magnetism, Carnegie Institution of Washington, under Division C3. (Photographs attached.) J. A. Fleming. NDCrc-187. Carnegie Institution of Washington. October 2, 1945.
- 311 Gyro Flux Gate**
- M1** Pioneer gyro flux gate compass system. Operations and service instructions. (Report No. 45-16D.) (n.a.) Bendix Aviation Corporation. [1944.]
- M2** Gyro-stabilized flux gate compass system. Handbook of operation and service instructions. (Handbook No. AN-05-15-16.) (n.a.) US Army Air Forces, US Navy Department and Air Council of the United Kingdom. Revised: May 20, 1944.
- 312 Inductor**
- M1** The development and tests of an inductor compass. (Report No. PI-104.) C. E. Grinstead. OEMsr-1121; OSRD No. 3002. General Motors Corporation. November 18, 1943.
- M2** The development and tests of an inductor compass. (Progress Report No. PI-119 [covering the period from] December, 1943 [to] May, 1944.) C. E. Grinstead. OEMsr-1121; OSRD No. 4196. General Motors Corporation. August 31, 1944.
- M3** Inductor compass tests on an M-3A1 light tank. (Report No. PI-123 [for the period] June [to] July, 1944.) C. E. Grinstead. OEMsr-1121; OSRD No.

4517. General Motors Corporation. November 15, 1944.

- M4** The design and development of the inductor compass. (Summary Report No. PI-131.) C. E. Grinstead. OEMsr-1121; OSRD No. 5064. General Motors Corporation. May 23, 1945.

313 Odographs

- M1** Odographs, course plotters or dead reckoning tracers. (n.a.) OSRD No. 1582. July 15, 1943.

313.1 Types

313.11 Aerial

- M1** Installation of aerial odograph in [Model] OA-10 43-43843. William Finley Wright, E. S. Hughes and A. G. McNish. NDCrc-187; OSRD No. 3785. Carnegie Institution of Washington. June 10, 1944.
- M2** Tests on aerial odograph in PBM-3S, No. 01677 [during the period from] December 10, 1943 to January 28, 1944 at US Naval Air Station, Quonset Point, R. I. Vaughn L. Agy. NDCrc-187; OSRD No. 3795. Carnegie Institution of Washington. June 12, 1944.
- M3** Tests of aerial odograph in RA-29 at Wright Field, Dayton, Ohio from February 2, 1944 to April 13, 1944. Vaughn L. Agy. NDCrc-187; OSRD No. 3805. Carnegie Institution of Washington. June 14, 1944.
- M4** The odograph installations in Ferrets Nos. 7 and 8 [in the] Southwest Pacific Area. Frank F. Weber and William Finley Wright. US Army Air Forces, Southwest Pacific Area. Revised: November 4, 1944.
- M5** Airborne odograph. Alfred B. Benson. OEMsr-426; OSRD No. 5396. International Business Machines Corporation. July 31, 1945.
- M6** Airborne odograph. Preliminary bulletin on Model AO-3. Operation and compensation. (n.a.) International Business Machines Corporation. (n.d.)

313.12 Ground

- M1** A trip to England, November 12, 1942 to February 1, 1943, including demonstration of the odograph, British aircraft compasses, British vehicular compasses, British dead-reckoning devices and British marine logs. Bryant Tuckerman. NDCrc-187; OSRD No. 1470. Carnegie Institution of Washington. March 31, 1943.
- M2** Land odograph. C. D. Lake and G. F. Daly. OSMsr-426; Research Project No. PDRC-641. International Business Machines Corporation. [April(?) 1943.]
- M3** Tests of odograph in half-track at Fort Belvoir, Virginia. ([Report covering period from] April 8, 1943 to May 5, 1943.) James M. Barry. NDCrc-187; OSRD No. 1614. Carnegie Institution of Washington, June 15, 1943.

- M4** Installation of odograph in T-15 cargo carrier. ([Report covering period from] January 6 to March 15, 1943.) J. L. Dalke. NDCrc-187; OSRD No. 1613. Carnegie Institution of Washington. June 19, 1943.

- M5** Tests of odograph in M-29 cargo carrier, cargo-carrying sled and special trailer. ([Report covering period from] October 26, 1943 to January 7, 1944.) James M. Barry. NDCrc-187; OSRD No. 3340. Carnegie Institution of Washington. April 1, 1944.

- M6** Tests of odograph in a 2½-ton amphibious truck. James M. Barry. NDCrc-187; OSRD No. 4239. Carnegie Institution of Washington. May 16, 1944.

- M7** The vehicular odograph. A. G. McNish, Bryant Tuckerman and Vaughn L. Agy. NDCrc-187; OSRD No. 4965. Carnegie Institution of Washington. April 10, 1945.

313.2 Air-Mileage Device

- M1** True air-mileage devices. William Finley Wright, Vaughn L. Agy and E. S. Hughes. NDCrc-187; OSRD No. 5016. Carnegie Institution of Washington. April 28, 1945.

313.3 Pedographs

- M1** The pedograph. J. L. Dalke. NDCrc-187; OSRD No. 4730. Carnegie Institution of Washington. February 28, 1945.
- M2** The step writer. R. J. Duffin. NDCrc-187; OSRD No. 4731. Carnegie Institution of Washington. February 28, 1945.

314 Magnesyn Remote-Indicating Compasses

- M1** A 400-cycle inverter for operating a magnesyn remote-indicating compass from 100-volts alternating current or direct current. Bryant Tuckerman and Max Malin. NDCrc-187; OSRD No. 4240. Carnegie Institution of Washington. September 16, 1944.

315 Demagnetization Studies

- M1** Demagnetizing military vehicles. (Preliminary Report No. PI-77.) Wayne T. Sproull. Project No. PI-4-R. General Motors Corporation. January 12, 1943.
- M2** Tests of magnetic eraser for military vehicles at Proving Grounds and at Washington, D. C. (Report No. PI-99.) Wayne T. Sproull. OEMsr-1121; OSRD No. 3202. General Motors Corporation. January 5, 1944.

320 Measuring Instruments

321 Oximeters

- M1** Oxygen-want indicator and flight research oximeter. (n.a.) OEMsr-12 and OEMsr-544; OSRD No. 1643. University of Pennsylvania and Central Scientific Company. January 1, 1944.
- M2** Oxygen-want indicator. K. H. Booty. OEMsr-

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- 544; OSRD No. 3854. Central Scientific Company. July 31, 1944.
- M3** Oximeters for use in aircraft. Glenn A. Millikan. OEMsr-12; OSRD No. 6429. University of Pennsylvania. January, 1946.
- 322 Fuel Measuring Devices**
- 322.1 Volume Measuring**
- M1** Review of methods of measuring the contents of fuel tanks. (Technical Note No. Inst-756.) F. Postlethwaite. OSRD Liaison Office No. II-5-7409(S). [Royal Aircraft Establishment, Great Britain.] March, 1943.
- M2** Simmonds capacitor fuel contents gauge. (Technical Note No. Inst-757.) G. E. Bennett and E. C. Voss. OSRD Liaison Office No. II-5-7408(S). [Royal Aircraft Establishment, Great Britain.] March, 1943.
- M3** Some characteristics of aircraft engine fuels. Their influence on capacitor-type tank gauges. Paul G. Exline and J. W. Dashiell. OEMsr-266; OSRD No. 4016. Gulf Research and Development Company. June 30, 1944.
- M4** An acoustic volume-measuring device. W. Caywood. OEMsr-1234; OSRD No. 5166. Carnegie Institute of Technology. May 31, 1945.
- M5** Aircraft fuel quantity gauge. (Parts I and II.) William G. Fastie and Joseph Razek. OEMsr-178 and OEMsr-266; OSRD No. 5672. Johns Hopkins University and Gulf Research and Development Company. October 31, 1945.
- 322.2 Devices for Increasing Combustion Efficiency of Boilers**
- M1** Combustion control. Carl S. Carlson. OEMsr-267. University of Pennsylvania. [1942(?)]
- M2** An instrument for measuring combustion efficiency. (Progress Report Nos. 296 and 335.) Carl S. Carlson. [OEMsr-267.] University of Pennsylvania. October 3 and December 1, 1942.
- M3** The development of an instrument to increase combustion efficiency. Carl S. Carlson and Miller J. Sullivan. OEMsr-267; OSRD No. 1237. [University of Pennsylvania.] February 1, 1943.
- M4** The development of an instrument to increase combustion efficiency. (Progress Report No. 4.) Carl S. Carlson and Miller J. Sullivan. OEMsr-267; OSRD No. 1471. [University of Pennsylvania.] April 1, 1943.
- M5** A discussion of factors affecting combustion efficiency in naval boilers. (Research Report No. 2.) Carl S. Carlson and Miller J. Sullivan. OEMsr-267. University of Pennsylvania. May 15, 1943.
- M6** A discussion of commercial carbon dioxide recorders under test. (Research Report No. 3.) Carl S. Carlson and Miller J. Sullivan. OEMsr-267. University of Pennsylvania. May 25, 1943.
- M7** The development of an instrument to measure combustion efficiency aboard naval vessels. (Progress Report No. 5.) Carl S. Carlson and Miller J. Sullivan. OEMsr-267. [University of Pennsylvania.] June 1, 1943.
- M8** Studies and experimental investigations in connection with the development of an instrument for use in measuring combustion efficiency in naval vessels. Carl S. Carlson and Miller J. Sullivan. OEMsr-267; OSRD No. 3144. University of Pennsylvania. November 30, 1943.
- M9** Combustion efficiency indicator investigation. (Progress Report No. 258.) W. E. Stephens. OEMsr-267. [University of Pennsylvania.] (n.d.)
- 323 Bombing Factors**
- 323.1 Bomb Drops and Bursts**
- M1** Army Air Force instrument trailer. (n.a.) OEMsr-1308. Shell Oil Company, Inc. October 18, 1944.
- 323.2 Telemetering Retardation Meter**
- M1** Telemetering retardation meter for bombs. (Progress Reports for February, April and June, 1943.) (n.a.) OEMsr-266; OSRD Nos. 1322, 1612 and 1556. Gulf Research and Development Company.
- M2** Bomb instrumentation telemetering retardation meter for bombs. L. J. Peters, Thomas Bardeen and E. J. Krack. OEMsr-266; OSRD Nos. 1888 and 3077. Gulf Research and Development Company. August 1 and October 1, 1943.
- M3** Bomb instrumentation telemetering retardation meter for bombs. (Final report.) L. J. Peters, Thomas Bardeen and E. J. Krack. OEMsr-266; OSRD No. 3704. Gulf Research and Development Company. May 10, 1944.
- 323.3 Bomb Impact**
- M1** Bomb instrumentation. Seismic measurements of bomb impact. L. J. Peters, Thomas Bardeen and E. J. Krack. OEMsr-266; OSRD Nos. 2000 and 3680. Gulf Research and Development Company. September 1, 1943 and May 15, 1944.
- 323.4 Photoflash Bombs**
- M1** Synchronization of photoflash bombs. (Progress Reports for June 15, 1944 and March 20, 1945.) Allen A. Walsh, C. W. Turner and E. Dudley Goodale. OEMsr-1256; Service Project No. OD-141; OSRD Nos. 3626 and 4893. National Broadcasting Company, Inc.
- M2** [A system of high-altitude night aerial photography.] Allen A. Walsh and J. Lewis Hathaway. OEMsr-1256; OSRD No. 5675. National Broadcasting Company, Inc. September 24, 1945.
- M3** Buckley Field tests [of] T-58 fuze equipment. (Supplementary report.) Allen A. Wash, J. Lewis Hathaway and Vernon J. Duke. OEMsr-1256; OSRD No. 5675. National Broadcasting Company, Inc. October 31, 1945.

- 323.5 Marine Measuring Devices**
- 323.51 Marine Speedometer**
- M1** The Department of Terrestrial Magnetism marine speedometer. R. J. Duffin. NDCrc-187; OSRD No. 3338. Carnegie Institution of Washington. June 30, 1944.
- 323.52 Hull Deflection Gauges**
- M1** Electromagnetic deflection unit, Types EMU-3 and EMU-3B. Instruction manual included. (n.a.) OEMsr-1203; OSRD No. 4566. Faximile, Inc. November 20, 1944.
- M2** Optical deflection gauge, Type A. Instruction manual included. (n.a.) OEMsr-1203; OSRD No. 4871. Faximile, Inc. May 31, 1945.
- 323.53 Propeller Blade Wall Thickness**
- M1** Measurements on propeller blades. Gerhard Herzog. OEMsr-1369; OSRD No. 4957. The Texas Company. December 16, 1944.
- 323.6 Oscillographs**
- 323.61 Cathode-Ray**
- M1** Cathode-ray oscillograph. Design and construction. H. J. Heim and Richard C. Webb. OEMsr-920; OSRD Nos. 1906 and 3216. Purdue University. November 4, 1943 and March 1, 1944.
- M2** The design and construction of a multi-channel recording cathode-ray oscillograph. C. B. White, R. H. McFee and others. OEMsr-1211; OSRD No. 3322. White Research Associates. June 1, 1944.
- M3** Four-unit cathode-ray oscillograph. Design, construction and operation. H. J. Heim and Richard C. Webb. OEMsr-920; OSRD No. 4937. Purdue University. June 15, 1945.
- M4** Four-unit cathode-ray oscillograph. Handbook of instructions for operation and maintenance. (n.a.) OEMsr-920. Purdue University. June 15, 1945.
- 323.62 High-Frequency Recording**
- M1** Development of a special multi-element oscillograph for Aberdeen Proving Ground. Claude M. Hathaway. OEMsr-823; OSRD No. 1688. Hathaway Instrument Company. July 19, 1943.
- M2** Special oscillograph for Aberdeen Proving Ground. Herbert Reno and Claude M. Hathaway. OEMsr-823; OSRD Nos. 3321 and 4344. Hathaway Instrument Company. December 28, 1943 and August 31, 1944.
- 323.7 High-Voltage X-Ray Radiography**
- M1** The Massachusetts Institute of Technology project in high-voltage radiography. (Reports for the period November 1, 1941 to June 15, 1943.) (n.a.) OEMsr-294; OSRD No. 1495. Massachusetts Institute of Technology.
- M2** The project in high-voltage radiography at Massachusetts Institute of Technology. (First bi-monthly report.) R. J. Van de Graaff. Massachusetts Institute of Technology. January 1, 1942.
- M3** Three to twenty million volt radiography work. (Progress Reports [covering period from] May 1, 1942 [through] January 1, 1945.) D. W. Kerst. OEMsr-241; OSRD Nos. 1566, 3384, 3075 and 4613. University of Illinois.
- M4** Three to twenty million volt radiography. Part I, Development of new 20-million volt betatron and of porcelain vacuum tube. Part II, Assembly and operation of the 4.5-million volt betatron. D. W. Kerst, G. M. Almy and others. OEMsr-241; OSRD No. 1944. University of Illinois. September 1, 1943.
- M5** Three to twenty million volt radiography. Development of the betatrons and porcelain envelope for vacuum tubes. G. M. Almy, G. D. Adams and R. K. Hursh. OEMsr-241; OSRD Nos. 3667 and 4210. University of Illinois. June 1 and September 1, 1944.
- M6** Three to twenty million volt radiography. Summary report on 20,000,000-volt betatron. G. M. Almy and G. D. Adams. OEMsr-241; OSRD No. 3668. University of Illinois. June 1, 1944.
- M7** The application of high-voltage electrostatic X-ray generators to radiography. E. A. Burrill, Jr. OEMsr-294; OSRD No. 3677. Massachusetts Institute of Technology. June 29, 1944.
- M8** Description and operating instructions of a 3.5-mev betatron, Model 43. H. W. Koch and G. M. Almy. OEMsr-241. University of Illinois. September 1, 1944.
- M9** Three to twenty million volt radiography. The application of the betatron to practical radiography. G. M. Almy and G. D. Adams. OEMsr-241; OSRD No. 4883. University of Illinois. May 1, 1945.
- M10** The Massachusetts Institute of Technology project in high-voltage radiography. Volume 4, Production, absorption and scattering of high-voltage X-rays. (n.a.) OEMsr-294; OSRD No. 4488. Massachusetts Institute of Technology. June 1, 1945.
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- M12** The Massachusetts Institute of Technology project in high-voltage radiography. Volume 7, Detailed drawings of X-ray generator parts. (n.a.) OEMsr-294; OSRD No. 4488. Massachusetts Institute of Technology. June 1, 1945.
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- 323.8 Miscellaneous Devices**
- 323.81 Radio Time Comparator**
- M1** Radio time comparator. W. F. Priest. OEMsr-

- 1448; OSRD No. 5042. Hughes Aircraft Company. September, 1945. 414
- 323.82 Tachometer (Electric Frequency Meter)**
- M1** Development of electric frequency meter, or tachometer. (Final Progress Report No. 264.) L. L. Nettleton. OEMsr-266. Gulf Research and Development Company. August 10, 1942. 420
- 323.83 Helium Impurities**
- M1** Helium project. [The development of an instrument giving simple and rapid measurement of the amount of air impurity in helium.] (Progress Report Nos. 77, 113 and 139.) Gaylord P. Harnwell. NDCrc-189. July 2, September 10 and November 10, 1941. 421
- M2** Development of improved helium purity indicator. (Progress Report No. 345 [covering the period] September 1, and November 1, 1942.) (n.a.) OEMsr-266. Gulf Research and Development Company. 422
- 400 ACOUSTICS AND NOISE CONTROL**
- 410 Generation of Noise**
- 411 Battle Noise**
- 411.1 Recordings**
- M1** Equipment for the reproduction of battle noise. E. N. Honan. OEMsr-868; Research Project No. 17.3-6; OSRD No. 3169. Western Electric Company, Inc. January 31, 1944.
- 411.2 Jungle Sounds**
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- M1** Jungle acoustics. Carl F. Eyring. OEMsr-1335; Service Project No. SC-105; OSRD No. 4699. Rutgers University. February 15, 1945.
- M2** Recordings of jungle sounds. Carl F. Eyring. OEMsr-1335; Service Project No. SC-105; OSRD No. 4704. Rutgers University. February 17, 1945.
- 412 Electronic Generation of Noise**
- M1** The electronic generation of airplane noise for use in testing and training. (Report No. MHR-33.) E. B. Newman and S. S. Stevens. OEMsr-658; OSRD No. 1445. Harvard University. May 25, 1943.
- M2** An electronic device to simulate atmospheric static. (Report No. IC-75.) S. S. Stevens, R. L. Wallace, Jr. and others. Harvard University. May 29, 1944.
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- M1** Sound absorbing properties of acoustical materials for use aboard ships of the US Navy. (Report No. CIR-34.) H. P. Sleeper, Jr. and Leo L. Beranek. OEMsr-1240; Service Project No. N-109; OSRD No. 4173. Harvard University. October 1, 1944.
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M1 The relative annoyance produced by various bands of noise. (Report No. IC-65.) T. W. Reese and K. D. Kryter. Harvard University. March 17, 1944.

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430 Sound Transmission

431 Attenuation

M1 Attenuation of intense sounds in the atmosphere. Vern O. Knudsen, R. W. Leonard and others.

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433 Wave Front Corrugations

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434 Sound Ranging

434.1 Sound Source Location Computing

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M2 Nomographic method of computing sound source locations. R. B. Lindsay. OEMsr-734; OSRD No. 3809. Duke University. April 22, 1944.

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M3 Discussion of Army Ground Forces reports, C-Misc-30, European Theater of Operations, and C-Misc-29, European Theater of Operations. (Report No. IC-2.) F. E. White. Duke University. March 2, 1945.

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M2 Dodar. Development of improved Model Signal Corps No. AN/PNS-1. T. G. Barnes and R. W. Collins. OEMsr-734; OSRD No. 5539. Duke University. October 10, 1945.

M3 Highly portable sound ranging microphone. Volume I, Development report. Volume II, Manufacturing drawings. John C. Stick, Jr. OEMsr-734; Service Project Nos. SOS-13 and MC-100; OSRD No. 5544. Duke University. November 6, 1945.

M4 Design of watertight equipment cases. E. B. Nichols. OEMsr-734; Service Project Nos. SOS-13 and MC-100; OSRD No. 6265. Duke University. December 15, 1945.

- 434.32 Binaural**
M1 Binaural listening systems. F. S. Claassen and W. C. Ranes, Jr. OEMsr-734; Service Project Nos. SOS-13 and MC-100; OSRD No. 5543. Duke University. November 7, 1945.
- 434.33 Nomographic**
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M2 Sound ranging nomograms and associated equipment. E. B. Nichols and F. E. White. OEMsr-734; Service Project No. SOS-13; OSRD No. 5541. Duke University. December 15, 1945.
- 434.331 Plotting Grids**
M1 Artillery plotting grids. E. B. Nichols. OEMsr-734; Service Project No. SOS-13; OSRD No. 5545. Duke University. December 17, 1945.
- 434.34 Dry Paper Recorders**
M1 Dry paper sound ranging recorder. F. S. Claassen. OEMsr-734; Service Project Nos. SOS-13 and MC-100; OSRD No. 5546. Duke University. November 28, 1945.
- 434.35 Miscellaneous Systems**
M1 The T-1 microphone developed by the Division of Physical War Research, Duke University, Durham, N. C. (Report No. IC-4.) John C. Stick, Jr. Duke University. May 22, 1945.
M2 Ballistic-burst method of sound ranging. R. H. Frick, Jr. OEMsr-734; OSRD No. 5542. Duke University. September 29, 1945.
M3 Proposed method of sounding ranging, eliminating meteorological connections. (Report No. IC-6.) R. H. Frick, Jr. Duke University. December 6, 1945.
- 434.4 Gun Ranging**
- 434.41 Analysis**
M1 Analysis of gun ranging records. (Report No. IC-1.) (n.a.) Duke University. February 12, 1945.
- 434.411 Microphonic**
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- 434.412 Seismic**
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- 434.5 Miscellaneous Sound Ranging Problems**
M1 Possible use of doppler effect in sound ranging. (Appendix attached. Report No. IC-5.) H. C. Silent and R. B. Lindsay. Duke University. October 26, 1945.
- 435 Speech and Hearing, as Affected by Noise and Other Factors**
- 435.1 Speech**
- 435.11 Intelligibility**
M1 Collected informal communications on the basic audibility of English words for use as oral codes, alphabetic equivalents, etc. (Report No. MHR-39.) M. H. Abrams, J. E. Karlin and others. OEMsr-658; OSRD No. 1571. Harvard University. July 9, 1943.
M2 Collected informal communications on articulation tests of interphone equipment. (Report No. MHR-40.) J. P. Egan, D. R. Griffin and others. OEMsr-658; OSRD No. 1572. Harvard University. July 9, 1943.
M3 Vocabularies for military communication in noise. M. H. Abrams and J. E. Karlin. OEMsr-658; OSRD No. 1919. Harvard University. August 25, 1943.
M4 Studies on the effect of noise on speech communication. J. P. Egan, Joseph Miller and others. OEMsr-658; OSRD No. 2038. Harvard University. November 25, 1943.
M5 The audibility in noise of a proposed fighter director vocabulary. (Report No. IC-57.) M. H. Abrams and Joseph Miller. Harvard University. December 31, 1943.
M6 Effects of high altitude on the human voice. H. Wayne Rudmose, Kenneth C. Clark and others. OEMsr-658; OSRD No. 3106. Harvard University. January 30, 1944.
M7 Auditory tests of the ability to hear speech in noise. (Report No. MHR-66.) J. E. Karlin, M. H. Abrams and others. OEMsr-658; OSRD No. 3516. Harvard University. September 1, 1944.
M8 Speech in noise. A study of the factors determining its intelligibility. (Report No. MHR-81.) M. H. Abrams, S. J. Goffard and others. OEMsr-658; OSRD No. 4023. Harvard University. September 1, 1944.
M9 Articulation testing methods. (Part II.) J. P. Egan. OEMsr-658; OSRD No. 3802. Harvard University. November 1, 1944.
M10 The effects of amplitude distortion upon the intelligibility of speech. J. C. R. Licklider. OEMsr-658; Service Project No. NA-108; OSRD No. 4217. Harvard University. November 15, 1944.
M11 The articulation efficiency of bands of speech in noise. J. P. Egan and Francis M. Wiener. OEMsr-658; Service Project Nos. NA-108 and NS-343;

OSRD No. 4872. Harvard University. May 1, 1945.

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- M1 Acoustical considerations in the design of an oxygen mask. Thomas E. Caywood and Leo L. Beranek. OEMsr-658; OSRD No. 952. Harvard University. October 19, 1942.
- M2 Speech and sound transmission through gas masks. J. P. Egan, E. B. Ginsburg and others. OEMsr-658; OSRD No. 1816. Harvard University. September 20, 1943.
- M3 Reaction of small enclosures on the human voice. Transmission of speech through gas masks. C. T. Morrow. OEMsr-658; Service Project No. CWS-28; OSRD No. 6309. Harvard University. October 26, 1945.

435.2 Hearing

435.21 Physiological Factors

- M1 Effect of sound on man and means for producing such sound. Harold Burris-Meyer, Theodore W. Forbes and W. L. Woolf. OEMsr-197; Service Project No. CWS-18; OSRD No. 1255. Stevens Institute of Technology. November 9, 1942.
- M2 Temporary deafness following exposure to loud tones and noise. Hallowell Davis, Clifford T. Morgan and others. OEMcmr-194. Harvard University, Medical School. September 30, 1943.
- M3 Injury of the inner ear produced by exposure to loud tones. (Supplementary report.) Joseph E. Hawkins, Jr., Moses H. Lurie and Hallowell Davis. OEMcmr-194. Harvard University, Medical School. December 31, 1943.
- M4 The pressure distribution in the auditory canal in a progressive sound field. (Report No. PNR-5.) A. S. Filler, Douglas A. Ross and Francis M. Wiener. OEMsr-658 and N5ori-76; Project No. II. Harvard University. December 1, 1945.
- M5 Tolerance for pure tones and speech in normal and hard-of-hearing ears. (n.a.) OEMsr-1201; Service Project No. AN-10; OSRD No. 6303. Central Institute for the Deaf. July 31, 1946.

435.211 Ear Defenders

- M1 Research on ear defenders. Norman A. Watson. NDCrc-128; Service Project No. SC-4; OSRD No. 536. University of California at Los Angeles. February 5, 1942.

435.212 Hearing Aids

- M1 Evaluation of hearing aids. Rudolph H. Nichols, Jr., Richard J. Marquis and others. OEMsr-658; Service Project No. AN-10; OSRD No. 4666. Harvard University. May 1, 1945.
- M2 Selection of hearing aids. (Report No. PNR-7.) Hallowell Davis and Douglas A. Ross. OEMsr-658

and N5ori-76; Project No. II. Harvard University. December 31, 1945.

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- M1 The effects of noise and vibration on psychomotor efficiency. S. S. Stevens. Project No. II; OSRD No. 32. Harvard University. March 31, 1941.
- M2 The effects of noise on psychomotor efficiency. Noise reduction in aircraft as related to communication, annoyance and injury. (Report No. MHR-4.) S. S. Stevens, J. P. Egan and others. OSRD No. 274. Harvard University. December 1, 1941.

435.23 Pitch and Intensity

- M1 Auditory tests for the ability to discriminate the pitch and the loudness of noises. (Report No. MHR-124.) J. E. Karlin. OEMsr-658; OSRD No. 5294. Harvard University. August 1, 1945.

435.24 Insulation Offered by:

435.241 Helmets

- M1 A modified tank crash helmet for use with a separate telephone headset. (Report No. IC-41.) B. M. Flynn and John Volkmann. Harvard University. August 15, 1943.
- M2 Measurements of acoustic insulation in three types of aviation helmets. (Report No. IC-89.) W. A. Shaw. Harvard University. August 7, 1944.
- M3 A comparison of the acoustic insulation afforded by certain aviation helmets when worn with oxygen masks and goggles. (Report No. IC-90.) W. A. Shaw. Harvard University. November 20, 1944.

435.242 Clothing

- M1 The impairment of acoustic transmission due to items of Army clothing for cold weather wear. (Part I, Report No. IC-76.) W. A. Shaw. Harvard University. June 28, 1944.
- M2 Impairment of acoustic transmission due to items of Army clothing for cold weather wear. (Part II, Report No. IC-118.) W. A. Shaw, D. E. Yates and E. B. Newman. Harvard University. April 20, 1945.

435.243 Headsets

- M1 The acoustic design of earphone sockets for helmets and headsets. (Report No. MHR-19.) D. R. Griffin, John Volkmann and others. OSRD No. 826. Harvard University. August 20, 1942.
- M2 An evaluation of the acoustic insulation and the acoustic sensitivity of the Harvard Design 8-C earphone socket. (Report No. IC-116.) W. A. Shaw, John Volkmann and others. Harvard University. April 7, 1945.
- M3 An analysis of the acoustic insulation and acoustic sensitivity of certain US Navy sound-powered head-

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435.25 Threshold of Hearing

- M1** Threshold of hearing for words. Manual of instructions for Auditory Test No. 9. (Report No. IC-73.) (n.a.) Harvard University. May 20, 1944.
- M2** Threshold of hearing for sentences. Manual of instructions for Auditory Test No. 12. (Report No. IC-96.) (n.a.) Harvard University. December 20, 1944.

436 Communications

436.1 Signals

- M1** Factors involved in the randomization of the radar pulse repetition frequency. (Report No. MHR-113.) W. R. Garner and S. E. Mitchell. OEMsr-658; Service Project No. NS-341; OSRD No. 5124. Harvard University. June 15, 1945.
- M2** The design of jamming signals for use against voice communications. (Report No. MHR-126.) G. A. Miller and S. E. Mitchell. OEMsr-658; Service Project No. SC-118; OSRD No. 5293. Harvard University. August 15, 1945.
- M3** The masking of signals by noise. S. S. Stevens. OEMsr-658; Service Project Nos. NA-108, AN-10 and NS-341; OSRD No. 5387. Harvard University. October 1, 1945.
- M4** Auditory factors in the discrimination of radio range signals. Collected informal reports. (Report No. MHR-104.) J. P. Flynn, S. J. Goffard and others. OEMsr-658; Service Project No. NA-108; OSRD No. 6292. Harvard University. December 31, 1945.

436.2 Impulse Counters

- M1** Counters. [The electron gun ratchet tube.] (Progress Report Nos. 41, 122 and 203 [covering the period] January 1 to June 30, 1941, August 1, 1941 to March 31, 1942.) Volney C. Wilson. NDCrc-68 and OEMsr-125; Research Project No. PDRC-177. University of Chicago.
- M2** High-speed electronic accumulator research. (Research Progress Report Nos. 2 to 6.) Joseph R. Desch. NDCrc-63. National Cash Register Company. April 1, May 29, August 1, October 1, 1941 and January 6, 1942.
- M3** Counter communication research. (Research Progress Report Nos. 7 and 8.) Joseph R. Desch. OEMsr-274. National Cash Register Company. March 18 and May 15, 1942.
- M4** Communication research involving impulse counters. (Research Progress Report No. 9 [for the] period May 15, 1942 to October 1, 1942.) Joseph R. Desch. OEMsr-274; OSRD No. 1190. National Cash Register Company. October 1, 1942.
- M5** Application of high-speed counter to time interval measurements. (Special Report No. 327.) E. Vin-

cent Gulden. National Cash Register Company. November 20, 1942.

- M6** Identification system [using high-speed electronic counter circuit]. (Special Research Report No. 326.) Frank X. Bucher. OEMsr-274. National Cash Register Company. November 30, 1942.

436.3 Equipment Performance

- M1** Measurements of insulation and sensitivity of service headsets. (Report No. MHR-131.) W. A. Shaw. OEMsr-658; Service Project No. NA-108; OSRD No. 6113. Harvard University. October 31, 1945.
- M2** Problems of voice communication in extremely high ambient noise [such as] landing vehicles, tracked. (Report No. MHR-103.) Harold L. Ericson, Joseph Miller and others. OEMsr-658; Service Project Nos. NA-108 and NS-315; OSRD No. 5532. Harvard University. December 31, 1945.
- M3** Audio characteristics of communication equipment. (Report No. PNR-6.) (n.a.) OEMsr-658 and N5ori-76; Project No. II. Harvard University. February 1, 1946.

436.31 Articulation Efficiency

- M1** The performance of communication equipment in noise. (Report No. MHR-21.) J. P. Egan, D. R. Griffin and others. OEMsr-658; OSRD No. 901. Harvard University. October 1, 1942.
- M2** The articulation efficiency of magnetic and dynamic earphones used with various earphone cushions in noise. (Report No. MHR-34.) J. P. Egan, S. J. Goffard and others. OEMsr-658; OSRD No. 1491. Harvard University. June 15, 1943.
- M3** Articulation-test comparisons of six Signal Corps aircraft interphones at low and high-altitudes. (Appendix attached. Report No. MHR-49.) K. D. Kryter. OEMsr-658; OSRD No. 1974. Harvard University. March 1, 1944.
- M4** Voltage gain and power output capability requirements for high-altitude interphone amplifiers. (Report No. MHR-50.) J. C. R. Licklider. OEMsr-658; OSRD No. 1975. Harvard University. March 10, 1944.
- M5** The articulation efficiency of nine carbon microphones for use at low altitudes. (Report No. MHR-64.) J. P. Egan, M. I. Stein and G. G. Thompson. OEMsr-658; OSRD No. 3515. Harvard University. June 1, 1944.
- M6** Articulation tests of A-14 and XA-13 oxygen masks at sea level and at 35,000 feet. (Report No. IC-55.) Douglas A. Ross, E. B. Ginsburg, Jr. and others. Harvard University. June 5, 1944.
- M7** Articulation tests of standard and modified interphones conducted during flight at 5,000 and 35,000 feet. (Appendices included. Report No. MHR-52.) J. C. R. Licklider and K. D. Kryter. OEMsr-658; OSRD No. 1976. Harvard University. July 1, 1944.

M8 The articulation efficiency of three types of headsets proposed for use by the Canadian Ground Forces. (Report No. IC-92.) J. P. Egan, W. A. Shaw and others. Harvard University. November 15, 1944.

M9 The articulation efficiency of certain American and foreign microphones. (Report No. IC-127.) S. J. Goffard, Joseph Miller and E. B. Newman. Harvard University. August 10, 1945.

436.32 Tests on Sets

436.321 Interphone Equipment

M1 Interphone equipment. (Report Nos. C-1 to C-31 [for the period] March 18, 1943 to June 30, 1944.) Rudolph H. Nichols, Jr., A. S. Filler and others. OEMsr-658; Service Project No. SC-48; OSRD Nos. 1524, 1545, 1927, 3682, 3683 and 3905. Harvard University.

M2 Collected informal reports on interphone equipment. Leo L. Beranek, Francis M. Wiener and others. OEMsr-658; OSRD No. 1324. Harvard University. April 12, 1943.

M3 Response characteristics of interphone equipment. (Revision No. IV to be inserted in OSRD Report No. 687.) Francis M. Wiener, H. Wayne Rudmose and others. OEMsr-658; OSRD No. 3105. Harvard University. January 1, 1944.

436.322 Headsets

M1 Microphone and headset studies. (Part I. Report No. MHR-48.) J. P. Egan, J. E. P. Libby and others. OEMsr-658; Service Project No. SC-48; OSRD No. 2037. Harvard University. November 20, 1943.

M2 Comparison of the intelligibility afforded by Type M and Type O sound-powered headsets. (Parts I and II. Report Nos. IC-108 and IC-119.) J. P. Egan, Francis M. Wiener and others. Harvard University. February 20 and April 23, 1945.

M3 The response of certain earphones on the ear and on closed couplers. (Report No. PNR-2.) Francis M. Wiener and A. S. Filler. OEMsr-658 and N5ori-76; Project No. II. Harvard University. December 1, 1945.

436.323 Test Equipment

M1 Design, operation and calibration of the sound pressure meter. Francis M. Wiener, Rudolph H. Nichols, Jr. and others. OEMsr-658; OSRD No. 1817. Harvard University. September 25, 1943.

M2 Sonic true-airspeed indicator. (Volumes I and II.) Julian Eisenstein, Kenneth C. Clark and Francis D. Carlson. OEMsr-658; Service Project No. NA-170; OSRD Nos. 5369 and 5370. Harvard University. August 27 and September 1, 1945.

M3 The design and construction of anechoic sound chambers. Leo L. Beranek, H. P. Sleeper, Jr. and others. OEMsr-658; Service Project Nos. NA-108

and AC-9; OSRD No. 4190. Harvard University. October 15, 1945.

436.324 Miscellaneous Tests

M1 A method of indicating time on voice recordings. Francis M. Wiener, R. A. Walker and Kenneth C. Clark. OEMsr-1240; Service Project Nos. N-109 and OFS-Nr-1; OSRD No. 4189. Harvard University. October 25, 1944.

M2 Microphones, earphone cushions and headsets for special applications. P. S. Veneklasen and Joseph Miller. OEMsr-658; Service Project No. NA-108; OSRD No. 6310. Harvard University. October 22, 1945.

M3 Collected reports on the performance of special communication equipment. Rudolph H. Nichols, Jr., R. L. Wallace, Jr. and others. OEMsr-658; Service Project Nos. NA-108 and NS-343; OSRD No. 6311. Harvard University. October 24, 1945.

M4 The technique of absolute pressure calibration of condenser microphones by the reciprocity method. (Report No. PNR-4.) Alfred L. DiMattia and Francis M. Wiener. OEMsr-658 and N5ori-76; Project No. II. Harvard University. December 10, 1945.

436.4 Communication Systems

436.41 Diving Operations

M1 A communication system for use in shallow water diving. R. L. Wallace, Jr. and C. T. Morrow. OEMsr-658; Service Project No. NS-343; OSRD No. 5375. Harvard University. July 25, 1945.

436.42 Submarine Tube

M1 Submarine voice-tube systems. R. L. Wallace, Jr., Thomas E. Caywood and others. OEMsr-658; OSRD No. 1889. Harvard University. October 15, 1943.

436.43 Sound-Powered Telephones

M1 Performance of US Navy sound-powered telephones. Francis M. Wiener, W. G. Wiklund and others. OEMsr-658 and OEMsr-1240; Service Project Nos. N-109 and OFS-Nr-1; OSRD No. 3789. Harvard University. June 15, 1944.

M2 Comparison of the intelligibility afforded by various modifications of Type M and Type O sound-powered telephones. (Part IV. Report No. IC-134.) J. P. Egan and Francis M. Wiener. Harvard University. September 15, 1945.

M3 Battle telephone adapter kits. (Report No. CIR-60.) H. Wayne Rudmose. Harvard University. Revised: October 30, 1945.

436.44 Portable Radios

M1 Audio frequency factors in portable radio equipment. Redesign of SCR-274N and ATA modulators. Performance of Eaves sound projector. (Report Nos. I to III.) Harold L. Ericson, Alfred

L. DiMattia and others. OEMsr-658; OSRD No. 1528. Harvard University. June 28, 1943.

436.45 Supersonic Signalling

(See also: 411.2)

M1 Supersonic signalling. Harold K. Schilling. OEMsr-1210; Project Nos. SC-105 and 17.3-21; OSRD No. 4219. Pennsylvania State College. September 18, 1944.

M2 Supersonic signalling in the tropics. Harold K. Schilling. OEMsr-1210; Project Nos. SC-105 and 17.3-21; OSRD No. 4496. Pennsylvania State College. December 16, 1944.

M3 Ultrasonic signalling. Harold K. Schilling. OEMsr-1210; Project Nos. SC-105 and 17.3-21; OSRD No. 5012. Pennsylvania State College. March 31, 1945.

436.46 Miscellaneous Systems

M1 Thin headphone for use under M-1 helmet. German handset, HAP-2. Submarine voice tube system. (Report Nos. CIC-22 and CIC-23.) W. W. Weedfall, R. L. Wallace, Jr. and E. S. Russell. OEMsr-658; OSRD No. 1805. Harvard University. September 15, 1943.

436.5 Telemetry Systems

M1 Radio telemetering of flight data. M. H. Nichols. OEMsr-1037; OSRD No. 4448. Princeton University. February 28, 1945.

M2 Radio telemetering of flight data. Summary of project activities from June, 1943 to October, 1945. M. H. Nichols. OEMsr-1037; OSRD No. 5679. Princeton University. October 22, 1945.

436.51 Sub-Carriers

M1 Airplane telemetering. Pickup systems. (Report No. 1215-W.) J. Kelly Johnson. NDCrc-194. Hazeltine Service Corporation. June 16, 1941.

M2 Airplane instrument telemetering. Modulation systems. (Report No. 1217-W.) J. Kelly Johnson. Hazeltine Service Corporation. June 18, 1941.

M3 Airplane instrument telemetering. (Progress Report Nos. 1226-W, 1251-W, 1283-W and 1333-W.) J. Kelly Johnson and M. J. DiToro. Hazeltine Service Corporation. August 4, September 27, 1941, April 3 and July 8, 1942.

M4 Airplane instrument telemetering equipment. (Final Progress Report Nos. 1396-W, 1413-W and 1498-W.) M. J. DiToro. NDCrc-194; OSRD No. 1366. Hazeltine Service Corporation. March 26, 1943.

436.511 Radio Telemetry

M1 Strain gauge investigation. (Progress Report Nos. 32 and 59.) Gaylord P. Harnwell. NDCrc-102. April 25 and June 10, 1941.

M2 Strain gauge investigation. (Final report.) Gaylord P. Harnwell. NDCrc-102. August 10, 1941.

M3 Strain gauge demonstrations. (Progress Report No. 206.) (n.a.) OEMsr-110. April 6, 1942.

M4 Proving Wurlitzer radio telemetering. (Progress Report No. 295.) (n.a.) Research Project No. PDRC-267. Rudolph Wurlitzer Company. July 2, 1942.

M5 Radio telemetering of aircraft instruments, pulse method. L. E. Hayslett. OEMsr-247; OSRD No. 1459. Rudolph Wurlitzer Company. December 1, 1943.

M6 Radio telemetering of strain gauge indications. (Final report.) L. E. Hayslett. OEMsr-247; OSRD No. 3214. Rudolph Wurlitzer Company. December 18, 1944.

436.512 Wattmeters

M1 Flight test recorder. Wattmeter-type strain gauge telemetering equipment. L. B. Greenleaf and E. L. Kent. OEMsr-1099; OSRD Nos. 1945 and 3426. C. G. Conn, Ltd. October 15, 1943 and June 14, 1944.

436.52 Commutation

M1 Bench tests of NDRC telemetering system, Type I, Model B. (Supplement included.) W. W. McBean and H. B. O. Davis. OEMsr-1037; OSRD No. 5041. Princeton University. June 1 and December 15, 1945.

436.521 Electronic

M1 Radio telemetering of strain gauges by electronic commutation. (Supplement included.) M. W. Arsove, R. B. Blizzard and others. OEMsr-1037; Service Project No. NA-134; OSRD Nos. 3385 and 3666. Princeton University. March 13 and 30, 1944.

M2 Test of electronic telemetering equipment at the Naval Air Experimental Station, July 1 through July 10 [1944]. M. W. Arsove, R. B. Blizzard and others. OEMsr-1037; OSRD No. 3936. Princeton University. July 17, 1944.

M3 Preliminary flight tests of electronic telemetering equipment for the period August 8 through August 22. (Supplement.) M. W. Arsove, R. B. Blizzard and others. OEMsr-1037; OSRD No. 3936. Princeton University. September 2, 1944.

M4 Radio telemetering of strain gauges by electronic commutation. R. B. Blizzard, J. F. Brinster and others. OEMsr-1037; Service Project No. NA-134; OSRD No. 4084. Princeton University. December 6, 1944.

436.522 Television

M1 The application of television for telemetering. (Status Report Nos. 217 and 241, as of April 1 and June 1, 1942.) F. J. Somers. Research Project Nos. PDRC-305 and RCA-173. National Broadcasting Company, Inc.

M2 The application of television to telemetering.

(Final Report as of April 30, 1943.) F. J. Somers. OEMsr-314; Research Project No. RCA-173; OSRD No. 1880. National Broadcasting Company, Inc. June 1, 1943.

437 Auditory Flight Indicators

437.1 Flybar

M1 Flybar [or] flying by auditory reference. (Report No. MHR-107.) Theodore W. Forbes, W. R. Garner and J. G. Howard. OEMsr-658; Service Project No. NA-108; OSRD No. 5123. Harvard University. June 1, 1945.

437.2 Sonic Position Indicating Equipment

M1 Sonic position indicating equipment for use in blind flying of towed gliders. R. L. Wallace, Jr., Harold L. Ericson and others. OEMsr-658; OSRD No. 3097. Harvard University. February 1, 1944.

437.3 Acoustic Direction Finding Equipment

M1 Acoustic direction finding for aircraft interception, including information on a microphone for operation in high wind velocities. R. L. Wallace, Jr. and Eugene Ennis. OSRD No. 317. Harvard University. December 15, 1941.

438 Noise Reduction

438.1 Circuits

M1 The performance of counter modulation and static-canceling circuits in aircraft radio receiver, AN/ARR-15. (Report No. PNR-9.) J. C. R. Licklider and S. J. Goffard. OEMsr-658 and N5ori-76; Project No. II. Harvard University. March 1, 1946.

M2 Effects of static on radio range performance. Laboratory tests of the improvement provided by noise reducing circuits. (Report No. PNR-10.) S. J. Goffard and J. C. R. Licklider. OEMsr-658 and N5ori-76; Project No. II. Harvard University. March 21, 1946.

438.2 Peak Clipper Units

M1 Articulation tests of the Wasmansdorff noise peak limiter. (Report No. IC-84.) J. C. R. Licklider, M. I. Stein and S. S. Stevens. Harvard University. September 12, 1944.

M2 The advantages of clipping the peaks of speech waves prior to radio transmission. (Report No. IC-83.) K. D. Kryter, M. I. Stein and S. S. Stevens. Harvard University. October 10, 1944.

M3 The combined effects of clipping the peaks of speech waves in an ATB transmitter and limiting static peaks in an ARB receiver. (Report No. IC-93.) K. D. Kryter, S. J. Goffard and S. S. Stevens. Harvard University. March 15, 1945.

M4 Field tests of pre-modulation clipping in the transmitter of a Type 19 wireless set. (Report No.

IC-121.) J. C. R. Licklider and E. B. Newman. Harvard University. May 8, 1945.

M5 A pre-modulation clipper unit for voice communication transmitters. (Report No. IC-100.) J. C. R. Licklider, G. A. Roberts and S. S. Stevens. Harvard University. June 30, 1945.

M6 A two-carrier system for radio communication. (Report No. MHR-135.) W. J. Cunningham and J. C. R. Licklider. Service Project Nos. NA-108 and NS-365; OSRD No. 6112. Harvard University. October 31, 1945.

440 Selection and Training of Personnel; Trainers

441 Voice Communication Training

M1 The problem of selecting and training personnel for communication in intense noise. (Report No. MHR-27.) (n.a.) OEMsr-658; OSRD No. 987. Harvard University. November 10, 1942.

M2 A project for standardizing submarine phraseology and developing a training program in submarine voice communications. (Report No. P57/R1421.) M. H. Abrams, Louis A. Mallory and others. OEMsr-658, OEMsr-830 and OEMsr-1128; Service Project No. N-118; OSRD No. 4795. Harvard University, Psychological Corporation and Columbia University, Division of War Research, New London Laboratory. February 28, 1945.

441.1 Selection of Speakers

M1 A speech interview for the selection of telephone talkers. (APP. Report No. 1.) (n.a.) OEMsr-830; Service Project No. N-109; OSRD No. 1769. Psychological Corporation. August, 1943.

441.2 Phase Actuated Locator (PAL) Trainer

M1 Operating instructions for the phase actuated locator training interphone, Type 202. (Report No. MI-21.) (n.a.) OEMsr-658. Harvard University. December 15, 1944.

442 Listening Programs

M1 A memory test for digits phonographically recorded for group administration. (Report No. IC-38.) M. H. Abrams, James F. Curtis and others. Harvard University. July 16, 1943.

M2 Ability to hear sentences in tones. Manual of instructions for Auditory Test No. 13. (Report No. IC-97.) (n.a.) Harvard University. December 28, 1944.

M3 The relation between the ability to listen in noise and ability to listen in stepped tones. (Report No. IC-98.) J. E. Karlin and S. S. Stevens. Harvard University. January 20, 1945.

443 Firing Error Indicator

M1 Firing error indicator. (First Interim Progress Report through Fourteenth Interim Progress Report [covering the period from] August 3, 1942 to May

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- 31, 1945.) Alex E. S. Green, Wolfgang K. H. Panofsky and Jesse W. M. DuMond. OEMsr-600; Service Project Nos. AC-46, NO-173 and NO-260; OSRD Nos. 1186, 1537, 1647, 3041, 3264, 3545, 3951, 4069, 4418, 4467, 4664 and 5260. California Institute of Technology.
- M2** Firing error indicating equipment. Instruction book. (n.a.) OEMsr-1108. Hoffman Radio Corporation. (n.d.)
- M3** Auxiliary standardizing and measuring equipment for the firing error indicator. (Appendix V.) (n.a.) (n.d.)
- 443.1 Shock Wave Theory**
- M1** Application of shock wave to the firing indicator problem. Wolfgang K. H. Panofsky and Alex E. S. Green. California Institute of Technology. September 16, 1942.
- M2** Experimental and theoretical study of ballistic shock-wave amplitude as a function of range, miss distance, caliber and other variables for application to a firing error indicator. (Parts I to III.) Alex E. S. Green, Jesse W. M. DuMond and Wolfgang K. H. Panofsky. OEMsr-600; OSRD No. 1646. California Institute of Technology. June 31, 1943.
- M3** A personal evaluation of the firing error indicator project. L. J. Sivian. October 4, 1945.
- M4** A determination of the wave forms and laws of propagation and dissipation of ballistic shock waves. (Appendix III.) (n.a.) (n.d.)
- 443.2 Systems**
- 443.21 Magnetic Bullet**
- M1** The magnetic bullet firing error indicator. (Supplementary Progress Report No. 279.) Alex E. S. Green and Wolfgang K. H. Panofsky. California Institute of Technology. September 2, 1942.
- 443.22 Acoustic**
- M1** The reliability of the acoustic firing error indicator. A radio-acoustic device for the quantitative scoring as well as the qualitative informing of gunners as to their errors of marksmanship when firing at airborne targets. Jesse W. M. DuMond. OEMsr-600; Service Project Nos. AC-46, NO-173 and NO-260; OSRD No. 4966. California Institute of Technology. June, 1944.
- M2** The acoustic firing error indicator. Jesse W. M. DuMond. OEMsr-600; Service Project Nos. AC-46, NO-173 and NO-260; OSRD No. 5733. California Institute of Technology. September 15, 1945.
- 443.23 Aperiodic**
- M1** The aperiodic firing error indicator. A radio-acoustic device for the quantitative scoring as well as the qualitative informing of gunners as to their errors of marksmanship when firing at airborne targets. (Appendices included.) (n.a.) OEMsr-600. California Institute of Technology. October, 1944.
- M2** The aperiodic firing error indicator. A radio-acoustic device for the quantitative scoring as well as the qualitative informing of gunners as to their errors of marksmanship when firing at airborne targets. (Appendices included.) Wolfgang K. H. Panofsky. OEMsr-600; OSRD Nos. 4967 and 4968. California Institute of Technology. May, 1945.
- M3** Sources of error in the aperiodic firing error indicator. (Appendix No. II.) (n.a.) (n.d.)
- M4** Notes on design and technique of manufacture and calibration of aperiodic condenser microphones for the firing error indicator. (Appendix No. IV.) (n.a.) (n.d.)
- 443.3 Scoring Equipment**
- 443.31 Firing Error Oscillograph**
- M1** Book of instructions [for the] firing error oscillograph. (n.a.) Research Project No. 17.3-13. California Institute of Technology. October 1, 1945.
- 443.32 Firing Error Camera**
- M1** Instruction book for firing error camera. (n.a.) OEMsr-600. California Institute of Technology. September, 1945.
- 443.33 Acoustic Target Receiving Station**
- M1** Book of instructions for the acoustic target receiving station, Model V. Wolfgang K. H. Panofsky. OEMsr-600; OSRD No. 1922. California Institute of Technology. August, 1943.
- M2** Functional specifications [for the] acoustic target receiving station, AN/GRR-1. (n.a.) OEMsr-600. California Institute of Technology. January 3, 1944.
- M3** Preliminary book [of] instruction [for] firing indicator receiving station, Model XI-A. (n.a.) OEMsr-600; Research Project No. 17.3-13. California Institute of Technology. October, 1945.
- 443.34 Microphones**
- M1** The tuned microphone bi-directional informing and scoring system of the acoustic firing error indicator. Alex E. S. Green and R. Ronald Rau. OEMsr-600; OSRD No. 1648. California Institute of Technology. September 13, 1943.
- M2** Functional specifications for firing error indicator system. (n.a.) Research Project No. 17.3-13. California Institute of Technology. September 11, 1945.
- M3** Condenser transmitter development. W. A. Munson, D. W. Farnsworth and S. Balashek. OEMsr-1457; OSRD No. 6398. Bell Telephone Laboratories, Inc. and Western Electric Company, Inc. September 15, 1945.
- M4** The geometry of shock-wave response for the

spherical firing error indicator transmitter. (Appendix No. I.) (n.a.) (n.d.) 453

443.35 Electronic Devices

M1 Book of instructions [for the] electronic marksmanship scoring device ground station, Models I and II. Wolfgang K. H. Panofsky. OEMsr-600; OSRD No. 1540. California Institute of Technology. March 18, 1943. 500

M2 Operating instructions and functional specifications for Model D field test instrument. (n.a.) Research Project No. 17.3-13. California Institute of Technology. October 31, 1945.

443.4 Scoring Systems

M1 Flight validation of the firing error indicator. D. G. Marlow, W. E. Deeds and E. R. Cohen. OEMsr-600; Service Project Nos. AC-46, NO-173 and NO-260; Research Project No. 17.3-13.1; OSRD No. 5553. California Institute of Technology. September, 1945.

450 Miscellaneous Instrumentation Research

451 Thermistors

M1 Thermistor investigation. (Final Progress Report Nos. 52 and 177, for the period from December 1, 1940 to February 1, 1942.) Otto H. Schmitt. OEMsr-75. University of Minnesota. 510

M2 [The fundamental properties of thermistors, and their applicability to filters.] (Progress Report Nos. 1 and 2.) Carol G. Montgomery. NDCrc-107. Yale University. April 15 and June 1, 1941.

M3 Thermistor investigation. (Progress Reports for April 15 and August 1, 1941.) (n.a.) Rensselaer Polytechnic Institute. 600

M4 Concerning the thermistor bolometer. (Progress Report No. 35.) Noel C. Jamison. Northwestern University. April 30, 1941. 610

M5 The thermistor bolometer. (Progress Report No. 80.) Noel C. Jamison. NDCrc-62. Northwestern University. July 9, 1941.

M6 Thermistor investigation. (Progress Report No. 143.) Otto H. Schmitt. OEMsr-75. University of Minnesota. December 1, 1941.

M7 Thermistor investigations. (Second, Third and Fifth Progress Reports.) Roger W. Hickman, Noel C. Jamison and others. OEMsr-60. Harvard University. December 29, 1941; February 15 and June 6, 1942. 620

M8 Thermistor investigations. (Final Progress Report No. 272 [covering period from] August 1, 1941 to August 1, 1942.) (n.a.) OEMsr-60. Harvard University. August 7, 1942.

452 Camera for Time Precision Measurements

M1 The XA-2 Zenith camera. George H. Bateman, Peter Krause and others. US Army Air Forces, 311th Reconnaissance Wing, Buckley Field, Colorado. November, 1945. 630

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M1 Firing strains in a 37-mm field gun. (Progress Report No. 183.) A. V. de Forest. OEMsr-155. Massachusetts Institute of Technology. February 16, 1942.

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M1 Summarized information on the high-frequency transient recorder. (n.a.) OEMsr-254. Brush Development Company. [November 23, 1942.]

M2 Magnetic disc plating. (n.a.) OEMsr-254; OSRD No. 1946. Brush Development Company. December 1, 1943.

M3 Investigations on new magnetic recording media. M. D. Temple, L. O. Olsen and others. OEMsr-254; OSRD No. 3399. Brush Development Company. February 29, 1944.

M4 Investigations on new magnetic recording media. O. Kornei, M. D. Temple and others. OEMsr-254; Service Project No. AC-238.02; OSRD No. 5325. Brush Development Company. June 30, 1945.

M5 The radio repeat unit, an application of magnetic recording. R. H. Carson and A. E. Sanderson. OEMsr-658; Service Project No. NS-343; OSRD No. 6070. Harvard University. October 1, 1945.

Strain Analyzers

M1 Development of a high-frequency strain analyzer. (First to Fifth Report.) (n.a.) OEMsr-254; OSRD No. 1615. Brush Development Company. June 1 and July 27, 1943.

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M1 Development of methods for determining the proper seating of gilding metal rotating bands on 105-mm shells in production. W. B. Kouwenhoven. OEMsr-1241; Service Project No. OD-151; OSRD Nos. 3627 and 4576. Johns Hopkins University. May 25, 1944 and January 13, 1945.

M2 Development of methods for determining the proper seating of gilding metal rotating bands on 105-mm shells in production. (Final report.) W. B. Kouwenhoven. OEMsr-1241; Service Project No. OD-151; OSRD No. 4869. Johns Hopkins University. March 31, 1945.

Combat Information Center Equipment

M1 New equipment for use in Combat Information Centers. C. J. Mullin, R. G. Huebschen and others. OEMsr-658; Service Project No. NS-343; OSRD No. 4974. Harvard University. Revised: April 13, 1945.

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M1 Final reports on Contract OEMsr-1441. (Division 13. Part III.) (n.a.) OEMsr-1441; OSRD No. 6280. Harvard University. December 1, 1945. Contains: Problem No. 1: Tests on direction

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finder systems. Harry Rowe Mimno. Service Project No. AN-30. Problem No. 2: Study of frequency modulation vs amplitude modulation for use in airborne very high frequency communication equipment. Alexander H. Wing, Jr. Service Project No. AC-230.03. Problem No. 4: Investigation of principles underlying the maximizing of communication intelligibility. W. J. Cunningham. Service Project Nos. NS-365 and NS-108. Problem No. 6: Aircraft-transmitter

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DIVISION 18 · WAR METALLURGY

List of Microfilmed Reports

- 10 INDICES OF DIVISION 18**
- M1** Indexing of War Metallurgy Committee reports to the War Production Board. (Advisory Report No. Special 8.) (n.a.) Contract No. WPB-1. National Academy of Sciences and War Production Board. October 24, 1945.
 - M2** Indexing of Division 18, NDRC reports. (Advisory Report No. M-660.) (n.a.) OEMsr-307; OSRD No. 6604. National Academy of Sciences. March 15, 1946.
 - M3** Indexing of Division 18, NDRC reports. Reports on heat resistant alloys. (Report No. M-664.) Katharine Forsyth. OEMsr-307; OSRD No. 6669. National Academy of Sciences. June 15, 1946.
- 100 AIRCRAFT MATERIALS**
- 101 Aluminum Alloys**
- M1** Suggested research on aluminum alloys from members of the aircraft industry. (Advisory Report No. M-654.) J. C. DeHaven. OEMsr-307; Survey Project No. SP-30; OSRD No. 6601. National Academy of Sciences. February 20, 1946.
 - M2** Indexing of Division 18, NDRC reports. Reports on aluminum alloys. (Progress Report No. M-662.) Helen L. Purdum. OEMsr-307; OSRD No. 6666. National Academy of Sciences. June 15, 1946.
- 101.1 Fabrication of Aluminum Alloys**
- M1** Correlation of information available on the fabrication of aluminum alloys. Section I, Classification and analysis of the forming of various parts. (Volume I. Final Report No. M-71.) George Sachs, D. T. Doll and others. OEMsr-822; Project Nos. NRC-45 and NA-126; OSRD No. 1673. Case School of Applied Science. July 23, 1943.
 - M2** Correlation of information available on the fabrication of aluminum alloys. Section II, Example of fabricating individual parts. Volume I, Final Report No. M-80.) George Sachs, D. T. Doll and others. OEMsr-822; Project Nos. NRC-45 and NA-126; OSRD No. 1674. Case School of Applied Science. July 23, 1943.
 - M3** Correlation of information available on the fabrication of aluminum alloys. Section I, Classification and analysis of the forming of various parts. (Volume II. Final Report No. M-132.) George Sachs, George B. Espey and others. OEMsr-822; Project Nos. NRC-43 and NA-126; OSRD No. 3060. Case School of Applied Science. December 15, 1943.
 - M4** Correlation of information available on the fabrication of aluminum alloys. Section II, Examples of fabricating individual parts. (Volume II, Final Report No. M-155.) George Sachs, D. T. Doll and others. OEMsr-822; Project Nos. NRC-43 and NA-126; OSRD No. 3061. Case School of Applied Science. December 15, 1943.
 - M5** Correlation of information available on the fabrication of aluminum alloys. Section III, Summary, contents and index of Sections I and II. (Final Report No. M-156.) George Sachs. OEMsr-822; Project Nos. NRC-43 and NA-126; OSRD No. 3063. Case School of Applied Science. December 15, 1943.
- 101.11 Properties of New Aluminum Alloys**
- M1** Correlation of information available on the fabrication of aluminum alloys. Section IV, Survey of the properties of new aluminum alloys. (Parts I to III. Final Report No. M-171.) George Sachs, George B. Espey and others. OEMsr-822; Project Nos. NRC-43 and NA-126; OSRD No. 3296. Case School of Applied Science. February 1, 1944.
 - M2** Correlation of information available on the fabrication of aluminum alloys. Section IV, Survey of the properties of new aluminum alloys. (Part IV. Final Report No. M-186.) George Sachs. OEMsr-822; Project Nos. NRC-43 and NA-126; OSRD No. 3554. Case School of Applied Science. April 10, 1944.
 - M3** Correlation of information available on the fabrication of aluminum alloys. Section IV, Survey of the properties of new aluminum alloys. (Final Report No. M-348.) George Sachs, George B. Espey and others. OEMsr-822; Project Nos. NRC-43 and NA-126; OSRD No. 4188. Case School of Applied Science. September 15, 1944.
- 101.12 Formability**
- M1** Correlation of information available on the fabrication of aluminum alloys. Section V, Formability of aluminum alloys for use in military aircraft. Part I, General introduction. Part II, Effects of non-uniform stresses and strains. (Final Report No. M-382.) George Sachs and J. D. Lubahn. OEMsr-822; Project Nos. NRC-43 and NA-126; OSRD No. 4348. Case School of Applied Science. November 2, 1944.
 - M2** Correlation of information available on the fabrication of aluminum alloys. Section V, Formability of aluminum alloys for use in military aircraft Part III, Stretch forming of angles with outer leg in tension. (Final Report No. M-447.) George Sachs and J. D. Lubahn. OEMsr-822; Project Nos. NRC-43 and NA-126; OSRD No. 4626. Case School of Applied Science. January 17, 1945.
 - M3** Correlation of information available on the fabrication of aluminum alloys. Section V, Formability of aluminum alloys for use in military aircraft.

- Part IV, Fundamentals of pure bending of an ideal plastic metal under conditions of plane stress. (Final Report No. M-478.) George Sachs, J. D. Lubahn and J. M. Taub. OEMsr-822; Project Nos. NRC-43 and NA-126; OSRD No. 4940. Case School of Applied Science. April 26, 1945.
- M4** Correlation of information available on the fabrication of aluminum alloys. Section V, Formability of aluminum alloys for use in military aircraft. Part V, Simple bending of rectangular shapes by means of dies. (Final Report No. M-487.) George Sachs, J. D. Lubahn and J. M. Taub. OEMsr-822; Project Nos. NRC-43 and NA-126; OSRD No. 5014. Case School of Applied Science. April 26, 1945.
- M5** Correlation of information available on the fabrication of aluminum alloys. Section V, Formability of aluminum alloys for use in military aircraft. Part VI, Stretching of rectangular bars. (Final Report No. M-536.) George Sachs, J. D. Lubahn and W. F. Brown, Jr. OEMsr-822; Project Nos. NRC-43 and NA-126; OSRD No. 5332. Case School of Applied Science. July 13, 1945.
- M6** Correlation of information available on the fabrication of aluminum alloys. Section V, Formability of aluminum alloys for use in military aircraft. Part VII, Experimental strain analysis of bent rectangular shapes. (Final Report No. M-616.) George Sachs, J. D. Lubahn and J. E. Schmitt. OEMsr-822; Project Nos. NRC-43 and NA-126; OSRD No. 6205. Case School of Applied Science. October 23, 1945.
- M7** Correlation of information available on the fabrication of aluminum alloys. Section V, Formability of aluminum alloys for use in military aircraft. Part VIII, Combined bending and tension of rectangular bars. (Final Report No. M-588.) George Sachs, J. D. Lubahn and J. E. Schmitt. OEMsr-822; Project Nos. NRC-43 and NA-126; OSRD No. 6331. Case School of Applied Science. November 19, 1945.
- M8** Correlation of information available on the fabrication of aluminum alloys. Section V, Formability of aluminum alloys for use in military aircraft. Part IX, Bending of T-sections. (Final Report No. M-591.) George Sachs, J. D. Lubahn and L. J. Ebert. OEMsr-822; Project Nos. NRC-43 and NA-126; OSRD No. 6332. Case School of Applied Science. November 19, 1945.
- 101.13 Beryllium-Aluminum Alloys**
- M1** Beryllium-aluminum alloys for engine parts. (Final Report No. M-107.) J. G. Thompson, V. C. F. Holm and others. Project Nos. NRC-7, AC-4 and NA-100; OSRD No. 1656. National Bureau of Standards. July 29, 1943.
- 101.2 Plastic Flow of Aluminum Aircraft Sheet**
- M1** Plastic flow of aluminum aircraft sheet under combined loads. (Part I. Progress Report No. M-141.) Maxwell Gensamer, W. T. Lankford, Jr. and J. T. Ransom. OEMsr-894; Project Nos. NRC-51 and NA-149; OSRD No. 1940. Carnegie Institute of Technology. October 15, 1943.
- M2** Plastic flow of aluminum aircraft sheet under combined loads. (Part II. Final Report No. M-328.) John R. Low, Jr. and T. A. Prater. OEMsr-864; Project Nos. NRC-52 and NA-150; OSRD No. 4052. Pennsylvania State College. August 22, 1944.
- M3** Plastic flow of aluminum aircraft sheet under combined loads. Part I, Development of tests for forming limits. Stress-strain curves under combined loads. (Final Report No. M-527.) Maxwell Gensamer, W. T. Lankford, Jr. and others. OEMsr-894; Project Nos. NRC-51, NA-149 and NA-150; OSRD No. 5282. Carnegie Institute of Technology. June 29, 1945.
- M4** Plastic flow of aluminum aircraft sheet under combined loads. Part II, Forming limits for aircraft sheets at room temperature. (Final Report No. M-528.) Maxwell Gensamer, W. T. Lankford, Jr. and others. OEMsr-894; Project Nos. NRC-51, NA-149 and NA-150; OSRD No. 5283. Carnegie Institute of Technology. June 29, 1945.
- M5** Plastic flow of aluminum aircraft sheet under combined loads. Part III, Effect of aging at room temperature on the properties of 75S in the circular hydraulic bulge test. (Final Report No. M-468.) Maxwell Gensamer, W. T. Lankford, Jr. and John Vajda. OEMsr-894; Project Nos. NRC-51, NA-149 and NA-150; OSRD No. 4832. Carnegie Institute of Technology. March 15, 1945.
- M6** Plastic flow of aluminum aircraft sheet under combined loads. Part IV, Theory of forming limits. (Final Report No. M-529.) Maxwell Gensamer, W. T. Lankford, Jr. and others. OEMsr-894; Project Nos. NRC-51, NA-149 and NA-150; OSRD No. 5284. Carnegie Institute of Technology. June 29, 1945.
- M7** Plastic flow of aluminum aircraft sheet under combined loads. Part V, Strain distribution in formed parts. (Final Report No. M-530.) E. A. Saibel, J. T. Ransom and others. OEMsr-894; Project Nos. NRC-51, NA-149 and NA-150; OSRD No. 5264. Carnegie Institute of Technology. June 29, 1945.
- 101.3 Properties of Aluminum Alloys**
- M1** The effect of impurities in aluminum alloys. (Advisory Report No. M-124.) Zay Jeffries. OEMsr-307; Project Nos. SP-17 and NA-119; OSRD No. 1731. National Academy of Sciences. August 18, 1943.
- M2** High-temperature properties of light alloys. Part I, Aluminum. (Final Report No. M-251.) L. L. Wyman. OEMsr-307; Project Nos. SP-15 and NA-137, OSRD No. 3607. National Academy of Sciences. April 15, 1944.
- M3** Fatigue and impact characteristics and notch effect

in tension of artificially-aged aluminum alloys. (Progress Report No. M-216.) (n.a.) OEMsr-307; Project Nos. SP-18 and NA-126; OSRD No. 3579. National Academy of Sciences. April 18, 1944.

102 Magnesium Alloys

- M1** An investigation of the present status of magnesium alloy sheet in the aircraft industry. (Advisory Report No. M-121.) Matthew A. Hunter. OEMsr-307; Project Nos. NRC-67 and SP-12; OSRD No. 1726. National Academy of Sciences. August 16, 1943.
- M2** A survey of research on magnesium and magnesium alloys being conducted by government agencies, branches of the armed services and producers and fabricators of magnesium. (Advisory Report No. M-553.) J. C. DeHaven. OEMsr-307; Survey Project No. SP-26; OSRD No. 5400. National Academy of Sciences. August 3, 1945.
- M3** Suggested research topics on magnesium and magnesium alloys. (Advisory Report No. M-652.) (n.a.) OEMsr-307; Survey Project No. SP-26; OSRD No. 6599. National Academy of Sciences. February 25, 1946.
- M4** Indexing of Division 18, NDRC reports. Reports on magnesium alloys. (Progress Report No. M-663.) Helen L. Purdum. OEMsr-307; OSRD No. 6667. National Academy of Sciences. June 15, 1946.

102.1 Properties and Heat Treatment

- M1** Properties and heat treatment of magnesium alloys. Part I, The effect of size upon tensile properties of specimens of magnesium alloy sheet. (Final Report No. M-103.) John E. Dorn and Dan M. Finch. OEMsr-647; Project Nos. NRC-21 and NA-144; OSRD No. 1818. University of California. September 3, 1943.
- M2** Properties and heat treatment of magnesium alloys. Part III, Damping capacity of magnesium alloys. (Final Report No. M-105.) John E. Dorn and Julius J. Jelinek. OEMsr-647; Project Nos. NRC-21 and NA-144; OSRD No. 1820. University of California. September 3, 1943.
- M3** Properties and heat treatment of magnesium alloys. Part IV, Heat treatment of magnesium alloys. (Final Report No. M-106.) John E. Dorn, Israel I. Cornet and others. OEMsr-647; Project Nos. NRC-21 and NA-144; OSRD No. 1821. University of California. September 3, 1943.
- M4** High-temperature properties of light alloys. Part II, Magnesium. (Final Report No. M-292.) L. L. Wyman. OEMsr-307; Project Nos. SP-15 and NA-137; OSRD No. 4150. National Academy of Sciences. September 18, 1944.

102.11 Notch Sensitivity

- M1** Properties and heat treatment of magnesium alloys. Part II, Notch sensitivity of magnesium alloys. (Final Report No. M-104.) John E. Dorn and J. L. Meriam. OEMsr-647; Project Nos. NRC-

21 and NA-144; OSRD No. 1819. University of California. September 3, 1943.

- M2** Properties and heat treatment of magnesium alloys. Section I, The sensitivity of magnesium alloy sheet to drilled, reamed and punched holes. John E. Dorn and Erich G. Thomsen. Section II, The notch sensitivity of magnesium alloy extrusions and the influence of various factors. John E. Dorn and Israel I. Cornet. (Part V. Final Report No. M-177.) OEMsr-647; Project Nos. NRC-21 and NA-144; OSRD No. 3043. University of California. December 20, 1943.

102.12 Fatigue Properties of Magnesium Alloy Sheet

- M1** Fatigue properties of magnesium alloys and structures. Fatigue properties of magnesium alloy sheet. (Progress Report No. M-36.) H. W. Russell. OEMsr-729; Research Project No. NRC-22; OSRD No. 1146. Battelle Memorial Institute. January 19, 1943.
- M2** Fatigue properties of magnesium alloys and structures. Fatigue properties of magnesium alloy sheet. (Progress Report No. M-76.) H. W. Russell. OEMsr-729; Research Project No. NRC-22; OSRD No. 1457. Battelle Memorial Institute. May 17, 1943.
- M3** Fatigue properties of magnesium alloys and structures. Fatigue properties of magnesium alloy sheet. (Progress Report No. M-125.) H. W. Russell. OEMsr-729; Project Nos. NRC-22 and NA-145; OSRD No. 1858. Battelle Memorial Institute. September 27, 1943.
- M4** Fatigue properties of magnesium alloys and structures. Fatigue properties of magnesium alloy sheet. (Part I. Final Report No. M-169.) L. R. Jackson, H. J. Grover and others. OEMsr-729; Project Nos. NRC-22 and NA-145; OSRD No. 3033. Battelle Memorial Institute. December 23, 1943.
- M5** Fatigue properties of magnesium alloys and structures. Fatigue properties of magnesium alloy sheet. (Part II. Final Report No. M-289.) L. R. Jackson, H. J. Grover and others. OEMsr-729; Project Nos. NRC-22 and NA-145; OSRD No. 3792. Battelle Memorial Institute. June 12, 1944.
- M6** Fatigue properties of magnesium alloys and structures. Fatigue properties of magnesium alloy sheet. (Part III. Final Report No. M-381.) L. R. Jackson, H. J. Grover and others. OEMsr-729; Project Nos. NRC-22 and NA-145; OSRD No. 4282. Battelle Memorial Institute. October 20, 1944.

102.13 Physical and Stress Corrosion of Magnesium Alloy Sheet

- M1** Physical and stress corrosion properties of magnesium alloy sheet. (Progress Report No. M-152.) Matthew A. Hunter. OEMsr-1033; Project Nos. NRC-67 and NA-147; OSRD No. 2063. Rensselaer Polytechnic Institute. November 25, 1943.
- M2** Stress-strain relationships for J₁ magnesium alloy extrusion under bi-axial stresses. (Report No. M-354.) Don M. Cunningham, Erich G. Thomsen

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and John E. Dorn. OEMsr-307; Project Nos. NRC-22 and NA-126; OSRD No. 4172. National Academy of Sciences. September 20, 1944.

102.2 Formability

- M1** Formability of magnesium alloy sheet. Part I, Elevated-temperature variable-speed tensile tests of magnesium alloys. (Final Report No. M-151.) John E. Dorn and A. C. Ballaseyus. OEMsr-839; Project Nos. NRC-44 and NA-146; OSRD No. 2062. University of California. November 19, 1943.
- M2** Formability of magnesium alloy sheet. Part II, Forming of bends on the Guerin press. (Final Report No. M-170.) John E. Dorn, Julius J. Jelinek and A. C. Ballaseyus. OEMsr-839; Project Nos. NRC-44 and NA-146; OSRD No. 2079. University of California. November 26, 1943.
- M3** Formability of magnesium alloy sheet. Part III, Evaluation of the deep drawing properties of magnesium alloys at elevated temperatures. (Final Report No. M-210.) John E. Dorn, Dan M. Finch and Julius J. Jelinek. OEMsr-839; Project Nos. NRC-44 and NA-146; OSRD No. 3350. University of California. March 8, 1944.
- M4** Formability of magnesium alloy sheet. Part IV, Forming stretch flanges in the Guerin press. (Final Report No. M-274.) John E. Dorn and Erich G. Thomsen. OEMsr-839; Project Nos. NRC-44 and NA-146; OSRD No. 3791. University of California. June 5, 1944.
- M5** Formability of magnesium alloy sheet. Part V, Forming shrink flanges in the Guerin press. (Final Report No. M-313.) John E. Dorn, Erich G. Thomsen and Don M. Cunningham. OEMsr-839; Project Nos. NRC-44 and NA-146; OSRD No. 3940. University of California. July 14, 1944.
- M6** Formability of magnesium alloy sheet. Part VI, Forming bends on the Guerin press. (Final Report No. M-330.) Erich G. Thomsen, Don M. Cunningham and John E. Dorn. OEMsr-839; Project Nos. NRC-44 and NA-146; OSRD No. 4042. University of California. August 10, 1944.
- M7** Formability of magnesium alloy sheet. Part VII, Stretch-forming magnesium alloys. (Final Report No. M-353.) Dan M. Finch, I. G. Lotze and John E. Dorn. OEMsr-839; Project Nos. NRC-44 and NA-146; OSRD No. 4171. University of California. September 20, 1944.

102.3 Deformation Characteristics

- M1** Deformation characteristics of magnesium alloys. (Progress Report No. M-150.) Charles S. Barrett, Fred N. Rhines and C. T. Haller. OEMsr-1083; Project Nos. NRC-70 and NA-148; OSRD No. 2076. Carnegie Institute of Technology. November 15, 1943.
- M2** Deformation characteristics of magnesium alloys. Metallography of commercial magnesium sheet. (Progress Report No. M-189.) Charles S. Barrett,

Fred N. Rhines and C. T. Haller. OEMsr-1083; Project Nos. NRC-70 and NA-148; OSRD No. 3016. Carnegie Institute of Technology. December 9, 1943.

- M3** Deformation characteristics of magnesium alloys. (Progress Report No. M-214.) Charles S. Barrett, Fred N. Rhines and C. T. Haller. OEMsr-1083; Project Nos. NRC-70 and NA-148; OSRD No. 3272. Carnegie Institute of Technology. February 14, 1944.
- M4** Deformation characteristics of magnesium alloys. (Progress Report No. M-276.) Charles S. Barrett, Fred N. Rhines and C. T. Haller. OEMsr-1083; Project Nos. NRC-70 and NA-148; OSRD No. 3713. Carnegie Institute of Technology. May 22, 1944.
- M5** Deformation characteristics of magnesium alloys. (Progress Report No. M-341.) Charles S. Barrett, Fred N. Rhines and others. OEMsr-1083; Project Nos. NRC-70 and NA-148; OSRD No. 4070. Carnegie Institute of Technology. August 10, 1944.
- M6** Deformation characteristics of magnesium alloys. (Final Report No. M-454.) Charles S. Barrett, Fred N. Rhines and others. OEMsr-1083; Project Nos. NRC-70 and NA-148; OSRD No. 4653. Carnegie Institute of Technology. January 29, 1945.

102.4 New Magnesium Alloys

- M1** Physical and stress corrosion properties of magnesium alloy sheet. (Final Report No. M-647.) Matthew A. Hunter, A. Jones and others. OEMsr-1033; Project Nos. NRC-67 and NA-147; OSRD No. 6596. Rensselaer Polytechnic Institute. February 7, 1946.

103 Miscellaneous

103.1 Corrosion-Fatigue Failure of Aircraft Control Cables

- M1** The corrosion-fatigue failure of aircraft control cables. Effect of lubrication on fatigue properties. (Progress Report No. M-31.) Dartrey Lewis. OEMsr-492; Project Nos. NRC-15 and N-101; OSRD No. 1137. John A. Roebling's Sons Company. January 12, 1943.
- M2** The corrosion-fatigue failure of aircraft control cables. The effect of sheave diameter on the fatigue life of aircraft cables. (Progress Report No. M-93.) Dartrey Lewis, A. H. Flury, Jr. and H. J. Godfrey. OEMsr-492; Research Project No. NRC-15; OSRD No. 1610. John A. Roebling's Sons Company. July 1, 1943.
- M3** The corrosion-fatigue failure of aircraft control cables. Fatigue tests under service loads. (Progress Report No. M-439.) H. J. Godfrey, A. H. Flury, Jr. and Dartrey Lewis. OEMsr-492; Project Nos. NRC-15 and N-101; OSRD No. 4543. John A. Roebling's Sons Company. December 29, 1944.
- M4** The corrosion-fatigue failure of aircraft control cables. Miscellaneous tests. (Progress Report No. M-452.) H. J. Godfrey, A. H. Flury, Jr. and

Dartrey Lewis. OEMsr-492; Project Nos. NRC-15 and N-101; OSRD No. 4602. John A. Roebling's Sons Company. January 17, 1945.

- M5** The corrosion-fatigue failure of aircraft control cables. (Final Report No. M-467.) Dartrey Lewis, A. H. Flury, Jr. and H. J. Godfrey. OEMsr-492; Project Nos. NRC-15 and N-101; OSRD No. 4819. John A. Roebling's Sons Company. February 26, 1945.

103.11 Metallic Coatings and Lubricants, Effect of

- M1** The corrosion-fatigue failure of aircraft control cables. The effect of metallic coatings and lubricants on fatigue properties. (Progress Report No. M-83.) Dartrey Lewis. OEMsr-492; Project Nos. NRC-15 and N-101; OSRD No. 1525. John A. Roebling's Sons Company. June 15, 1943.
- M2** The corrosion-fatigue failure of aircraft control cables. The effect of metallic coatings and lubricants on the fatigue and internal friction properties of aircraft cables. (Progress Report No. M-207.) H. J. Godfrey, A. H. Flury, Jr. and Dartrey Lewis. OEMsr-492; Project Nos. NRC-15 and N-101; OSRD No. 3346. John A. Roebling's Sons Company. March 1, 1944.

103.2 The Effect of Shot Peening on Steel

- M1** Effect of shot blasting on mechanical properties of steel. (Progress Report No. M-40.) R. L. Mattson and J. O. Almen. [OEMsr-1123;] Project Nos. NRC-40 and NA-115; OSRD No. 1205. General Motors Corporation. February 10, 1943.
- M2** Effect of shot blasting on the mechanical properties of steel. (Part I. Progress Report No. M-228.) R. L. Mattson and J. O. Almen. OEMsr-1123; Project Nos. NRC-40 and NA-115; OSRD No. 3274. General Motors Corporation. February 19, 1944.
- M3** Effect of shot blasting on the mechanical properties of steel. (Part II. Progress Report No. M-476.) R. L. Mattson and J. O. Almen. OEMsr-1123; Project Nos. NRC-40, NA-115 and OD-177; OSRD No. 4825. General Motors Corporation. March 16, 1945.
- M4** Effect of shot blasting on the mechanical properties of steel. (Part III. Final Report No. M-661.) J. O. Almen, R. L. Mattson and H. E. Fonda. OEMsr-1123; Project Nos. NRC-40 and NA-115; OSRD No. 6647. General Motors Corporation. April 1, 1946.

103.3 Fatigue Properties of Structures

- M1** The effect of combined stresses on the ductility of metals. (Report No. M-213.) John E. Dorn and Erich G. Thomsen. OEMsr-307; Project Nos. NRC-21 and NA-144; OSRD No. 3218. National Academy of Sciences. February 2, 1944.
- M2** Fatigue properties of aircraft materials and structures. (Advisory Report No. M-653.) L. R. Jackson, H. J. Grover and R. C. McMaster. OEMsr-

307; Survey Project No. SP-27; OSRD No. 6600. National Academy of Sciences. March 1, 1946.

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ARMOR

- M1** [Development of armor.] Report titled: Report to Dr. J. B. Conant, Chairman, National Defense Research Committee from the *ad hoc* Committee on Armor Plate. Edgar C. Bain, Charles H. Herty, Jr. and others. November 18, 1941.
- M2** Indexing of Division 18, NDRC reports. Reports on cast and rolled armor. (Advisory Report No. M-646.) Helen L. Purdum. OEMsr-307; OSRD No. 6595. National Academy of Sciences. February 28, 1946.

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The Improvement of Low-Alloy Armor Steel

- M1** Improvement of low-alloy armor steels. (Progress Report No. M-20.) C. H. Lorig and Philip C. Rosenthal. OEMsr-450; Project Nos. NRC-14 and OD-87; OSRD No. 1032. Battelle Memorial Institute. November 10, 1942.
- M2** Improvement of low-alloy armor steel. Literature survey. (Progress Report No. M-25.) C. H. Lorig. OEMsr-450; Project Nos. NRC-14 and OD-87; OSRD No. 1056. Battelle Memorial Institute. November 25, 1942.
- M3** Improvement of low-alloy armor steels. (Progress Report No. M-52.) Philip C. Rosenthal, M. C. Udy and others. OEMsr-450; Project Nos. NRC-14 and OD-87; OSRD No. 1243. Battelle Memorial Institute. March 1, 1943.
- M4** Improvement of low-alloy armor steels. (Progress Report No. M-77.) C. H. Lorig, Philip C. Rosenthal and others. OEMsr-450; Project Nos. NRC-14 and OD-87; OSRD No. 1418. Battelle Memorial Institute. May 13, 1943.
- M5** The improvement of low-alloy armor steels. A summary of the experimental work on heavy armor steels. (Progress Report No. M-480.) Philip C. Rosenthal, G. K. Manning and C. H. Lorig. OEMsr-450; Project Nos. NRC-14 and OD-87; OSRD No. 4718. Battelle Memorial Institute. February 19, 1945.

201.1

Cracking and Fracture

- M1** Non-ballistic test for armor plate. (Final Report No. M-87.) Maxwell Gensamer, Charles S. Barrett and others. OEMsr-417; Project Nos. NRC-6 and OD-84; OSRD No. 2041. Carnegie Institute of Technology. November 3, 1943.
- M2** [The] improvement of low-alloy armor steels. Part VII, The causes of intergranular fracture in cast armor plate. (Final Report No. M-286.) C. H. Lorig, G. K. Manning and others. OEMsr-450; Project Nos. NRC-14 and OD-87; OSRD No. 3688. Battelle Memorial Institute. May 18, 1944.
- M3** The improvement of low-alloy armor steels. Part XI, The causes of quench cracking in cast armor steel. (Final Report No. M-465.) M. C. Udy, M. K. Barnett and others. OEMsr-450; Project Nos.

NRC-14 and OD-87; OSRD No. 4667. Battelle Memorial Institute. February 6, 1945.

- M4** The improvement of low-alloy armor steels. Part XVIII, Continuation of dilatometric studies of armor with respect to quench cracking. (Final Report No. M-621.) M. C. Udy, G. K. Manning and others. OEMsr-450; Project Nos. NRC-14 and OD-87; OSRD No. 6296. Battelle Memorial Institute. November 6, 1945.

201.2 Transformation Characteristics

- M1** Correlation of metallographic structure and hardness limit in armor plate. Part I, Effects of austenite transformation products on ballistic properties. (Final Report No. M-118.) C. H. Lorig, Arthur R. Elsea and others. OEMsr-448; Project Nos. NRC-5 and OD-83; OSRD No. 1696. Battelle Memorial Institute. August 5, 1943.
- M2** Correlation of metallographic structure and hardness limit in armor plate. Part II, Correlation of microstructure and ballistic properties. Part III, Analyses of problems presented by individual producers. (Final Report No. M-154.) C. H. Lorig, Arthur R. Elsea and others. OEMsr-448; Project Nos. NRC-5 and OD-83; OSRD No. 1949. Battelle Memorial Institute. October 19, 1943.
- M3** Improvement of low-alloy armor steels. Part XII, Mechanical properties of various isothermally developed structures compared with those of martensite tempered to the same hardness. (Final Report No. M-402.) John G. Kura, G. K. Manning and others. OEMsr-450; Project Nos. NRC-14 and OD-87; OSRD No. 4289. Battelle Memorial Institute. October 26, 1944.
- M4** The improvement of low-alloy armor steels. Part XIII, The evaluation of constant temperature transformation. (Final Report No. M-427.) Arthur R. Elsea, Philip C. Rosenthal and others. OEMsr-450; Project Nos. NRC-14 and OD-87; OSRD No. 4456. Battelle Memorial Institute. December 11, 1944.
- M5** The improvement of low-alloy armor steels. Part XIV, The effect of stress and strain on the isothermal transformation of austenite. (Final Report No. M-470.) Arthur R. Elsea, Philip C. Rosenthal and others. OEMsr-450; Project Nos. NRC-14 and OD-87; OSRD No. 4668. Battelle Memorial Institute. February 6, 1945.
- M6** The improvement of low-alloy armor steels. Part XV, Determination of martensite transformation points. (Final Report No. M-511.) M. C. Udy, G. K. Manning and others. OEMsr-450; Project Nos. NRC-14 and OD-87; OSRD No. 5028. Battelle Memorial Institute. April 30, 1945.

201.3 Properties

- M1** Improvement of low-alloy armor steels. Part IV, Effect of nickel on the low-temperature notched bar toughness of low-alloy armor steels. (Final Report No. M-222.) C. H. Lorig, John G. Kura and others. OEMsr-450; Project Nos. NRC-14 and

OD-87; OSRD No. 3298. Battelle Memorial Institute. February 19, 1944.

- M2** Improvement of low-alloy armor steels. Part V, The effect of draw practice on the mechanical properties of six armor plate steels. (Final Report No. M-245.) C. H. Lorig, G. P. Krumlauf and others. OEMsr-450; Project Nos. NRC-14 and OD-87; OSRD No. 3423. Battelle Memorial Institute. March 30, 1944.
- M3** Improvement of low-alloy armor steels. Part VI, The effect of melting practice on the properties of armor steel. (Final Report No. M-263.) C. H. Lorig, Philip C. Rosenthal and others. OEMsr-450; Project Nos. NRC-14 and OD-87; OSRD No. 3535. Battelle Memorial Institute. April 17, 1944.
- M4** Improvement of low-alloy armor steels. Part VIII, Effect of heat-treating variables on the microstructure and mechanical properties of low-alloy armor steel. (Final Report No. M-287.) C. H. Lorig, Arthur R. Elsea and others. OEMsr-450; Project Nos. NRC-14 and OD-87; OSRD No. 3674. Battelle Memorial Institute. May 18, 1944.
- M5** Improvement of low-alloy armor steels. Part IX, Heating and cooling rates of heavy armor plate and calibration of an air-cooled hardenability specimen. (Final Report No. M-311.) C. H. Lorig, John G. Kura and others. OEMsr-450; Project Nos. NRC-14 and OD-87; OSRD No. 3840. Battelle Memorial Institute. June 23, 1944.
- M6** Improvement of low-alloy armor steels. Part XVII, A correlation between the predicted microstructure and hardness and the actual microstructure and hardness of various sized rounds and plates. (Final Report No. M-620.) M. C. Udy, Arthur R. Elsea and others. OEMsr-450; Project Nos. NRC-14 and OD-87; OSRD No. 6295. Battelle Memorial Institute. November 6, 1945.

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Boron-Treated Armor Plate

- M1** Boron in steel. (Report No. M-18.) Robert S. Archer, Edgar C. Bain and others. OEMsr-307; Project Nos. NRC-37 and OD-74; OSRD No. 973. National Academy of Sciences. November 3, 1942.
- M2** Investigation of boron in armor plate. Influence of variations in boron, carbon and manganese contents on the weldability of steels for armor plate and other military applications. (Progress Report No. M-57.) Thomas G. Digges. Project Nos. NRC-31 and OD-87; OSRD No. 1282. National Bureau of Standards. March 12, 1943.
- M3** Investigation of boron in armor plate. Influence of nitrogen on some properties of steels with and without boron and titanium additions. (Progress Report No. M-84.) Thomas G. Digges. Project Nos. NRC-31 and OD-87; OSRD No. 1506. National Bureau of Standards. June 3, 1943.
- M4** Improvement of low-alloy armor steels. Part II, Boron in steel of armor composition. (Final Report No. M-140.) C. H. Lorig, Philip C. Rosenthal and M. C. Udy. OEMsr-450; Project Nos. NRC-14 and

OD-87; OSRD No. 1834. Battelle Memorial Institute. September 16, 1943.

M5 Improvement of low-alloy armor steels. Part III, Control of carbon in the carburized zone of face-hardened armor. (Final Report No. M-145.) C. H. Lorig, G. P. Krumlauf and G. K. Manning. OEMsr-450; Project Nos. NRC-14 and OD-87; OSRD No. 1842. Battelle Memorial Institute. September 16, 1943.

M6 Improvement of low-alloy armor steels. Part XVI, Study of the effect of boron on steels suitable for use in armor from three to six inches in thickness. (Final Report No. M-619.) M. C. Udy, Philip C. Rosenthal and others. OEMsr-450; Project Nos. NRC-14 and OD-87; OSRD No. 6294. Battelle Memorial Institute. November 6, 1945.

202.1 Boron Addition Influences

202.11 Carbon-Manganese Content

M1 Investigation of boron in armor plate. Influence of variations in boron, carbon and manganese contents on some properties of steels for armor plate and other military applications. (Progress Report No. M-34.) Thomas G. Digges. Project Nos. NRC-31 and OD-87; OSRD No. 1159. National Bureau of Standards. January 18, 1943.

M2 Investigation of boron in armor plate. Influence of variations in boron, composition of ferroalloys used for making boron additions and deoxidation practice on some properties of experimental steels containing 0.3 percent carbon and 1.6 percent manganese. (Progress Report No. M-96.) Thomas G. Digges. Project Nos. NRC-31 and OD-87; OSRD No. 1617. National Bureau of Standards. July 16, 1943.

M3 Investigation of boron in armor plate. Influence of boron and nickel on some properties of experimental steels containing 0.3 percent carbon and 0.8 percent manganese. (Progress Report No. M-128.) Thomas G. Digges. Project Nos. NRC-31 and OD-87; OSRD No. 1860. National Bureau of Standards. September 27, 1943.

M4 Investigation of boron in armor plate. Influence of variations in boron and compositions of ferroalloys used for making boron additions on some properties of basic open hearth steels containing 0.4 percent carbon and 1.6 percent manganese. (Report No. M-336.) Thomas G. Digges and Fred M. Reinhart. Project Nos. NRC-31 and OD-87; OSRD No. 4022. National Bureau of Standards. August 9, 1944.

M5 Investigation of boron in armor plate. Endurance properties of basic open hearth steel containing 0.4 percent carbon and 1.6 percent manganese without and with boron addition. (Progress Report No. M-387.) L. R. Jackson, J. M. Berry and others. OEMsr-721; Project Nos. NRC-31 and OD-87; OSRD No. 4235. Battelle Memorial Institute. October 10, 1944.

202.12 Miscellaneous Content

M1 Investigation of boron in armor plate. Influence of boron and chromium on some properties of experimental steels containing 0.3 percent carbon and 0.8, 1.25 or 1.6 percent manganese. (Progress Report No. M-174.) Thomas G. Digges and Fred M. Reinhart. Project Nos. NRC-31 and OD-87; OSRD No. 3020. National Bureau of Standards. December 16, 1943.

M2 Investigation of boron in armor plate. Influence of nitrogen on some properties of experimental steels without and with boron. (Progress Report No. M-231.) Thomas G. Digges and Fred M. Reinhart. Project Nos. NRC-31 and OD-87; OSRD No. 3378. National Bureau of Standards. March 15, 1944.

M3 Investigation of boron in armor plate. Influence of boron on some properties of experimental steels containing nickel and chromium. (Progress Report No. M-293.) Thomas G. Digges and Fred M. Reinhart. Project Nos. NRC-31 and OD-87; OSRD No. 3769. National Bureau of Standards. June 10, 1944.

M4 Investigation of boron in armor plate. Influence of boron on some properties of experimental steels containing 0.3 percent carbon and varying amounts of manganese, chromium and molybdenum. (Final Report No. M-361.) Thomas G. Digges and Fred M. Reinhart. OEMsr-721; Project Nos. NRC-31 and OD-87; OSRD No. 4181. Battelle Memorial Institute. September 25, 1944.

203

Effects of Hydrogen, Nitrogen and Oxygen in Armor Plate

M1 The effects of hydrogen, nitrogen and oxygen in armor plate. Literature survey. (Progress Report No. M-23.) C. H. Lorig. OEMsr-449; Project Nos. NRC-4 and OD-38-2; OSRD No. 1065. Battelle Memorial Institute. November 25, 1942.

M2 Effects of hydrogen, nitrogen and oxygen in armor plate. Part I, Fractional vacuum fusion analyses of rolled and cast armor plate samples. (Final Report No. M-139.) C. H. Lorig, Arthur R. Elsea and Philip C. Rosenthal. OEMsr-449; Project Nos. NRC-4 and OD-38-2; OSRD No. 1830. Battelle Memorial Institute. September 16, 1943.

M3 Effects of hydrogen, nitrogen and oxygen in armor plate. Part II, Aluminum nitride as an intergranular precipitate. (Final Report No. M-153.) C. H. Lorig, Arthur R. Elsea and others. OEMsr-449; Project Nos. NRC-4 and OD-38-2; OSRD No. 1941. Battelle Memorial Institute. October 19, 1943.

204

Manufacture and Welding

204.1

Face-Hardened Armor

M1 The development of processes for the manufacturing and welding of case-carburized armor plate from non-alloy steels. Part I, Results of experi-

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mental work on prime armor processed from plain carbon and low-alloy boron-treated steels. (Final Report No. M-491.) V. E. Hense, Donald P. Buswell and R. B. Schenck. OEMsr-971; Project Nos. NRC-30 and OD-74; OSRD No. 4860. General Motors Corporation. March 24, 1945.

- M2** The development of processes for the manufacturing and welding of case-carburized armor plate from non-alloy steels. Part II, Results of experimental work on prime armor processed from low-alloy boron-treated and standard commercial face-hardening grade steels. (Report No. M-551.) V. E. Hense, Donald P. Buswell and R. B. Schenck. OEMsr-971; Project Nos. NRC-30 and OD-74; OSRD No. 5353. General Motors Corporation. July 19, 1945.

204.2 Homogeneous Armor

- M1** Effects of flame hardening on the ballistic properties of pre-heat treated homogeneous armor plate. (Progress Report No. M-233.) E. L. Bartholomew, Jr. M. S. Burton and others. OEMsr-547; Project Nos. NRC-23 and OD-88; OSRD No. 3416. Massachusetts Institute of Technology. March 21, 1944.
- M2** Manufacturing and welding of homogeneous armor plate from boron-treated plain carbon and low-alloy steels. Part I, Results of experimental work on prime homogeneous armor. (Final Report No. M-431.) V. E. Hense, Donald P. Buswell and others. OEMsr-975; Project Nos. NRC-29 and OD-74; OSRD No. 4482. General Motors Corporation. December 14, 1944.
- M3** Manufacturing and welding of homogeneous armor plate from boron-treated plain carbon and low-alloy steels. Part II, Results of experimental work on welded homogeneous armor. (Final Report No. M-519.) V. E. Hense, S. M. Spice and others. OEMsr-975; Project Nos. NRC-29 and OD-74; OSRD No. 5142. General Motors Corporation. May 28, 1945.

205 Flame Hardening

- M1** Effects of flame hardening on the ballistic properties of pre-heat treated homogeneous armor plate. (Final Report No. M-329.) E. L. Bartholomew, Jr., M. S. Burton and others. OEMsr-547; Project Nos. NRC-23 and OD-88; OSRD No. 4110. Massachusetts Institute of Technology. September 5, 1944.

206 Non-Magnetic Armor Steel

- M1** Effect of alloying elements upon the physical and magnetic properties of Hadfield's steel for armor plate. (Report No. 138, to November 11, 1941.) John Chipman. Project Nos. B-104, NO-B13 and AC-6-2; OSRD No. 191. Massachusetts Institute of Technology. December 6, 1941.
- M2** Ballistic tests on some experimental non-magnetic steels for armor plate. (Report No. M-2.) John Chipman and A. R. Kaufman. OEMsr-190 and

OEMsr-185; OSRD No. 480. Massachusetts Institute of Technology. March 10, 1942.

- M3** Non-magnetic steels for armor plate. (Final Report No. M-14.) John Chipman, A. R. Kaufman and Morris Cohen. OEMsr-190; Project Nos. B-104 and AC-6; OSRD No. 822. Massachusetts Institute of Technology. August 25, 1942.

207

Heat Treatment

- M1** Heat treatment of National Emergency steels for use in tanks, combat cars, gun mounts and other ordnance materiel. (Progress Report No. M-126.) A. L. Boegehold and E. W. Weinman. Project Nos. NRC-55 and OD-115; OSRD No. 1768. General Motors Corporation. September 1, 1943.
- M2** Heat treatment of National Emergency steels for use in tanks, combat cars, gun mounts and other ordnance materiel. (Progress Report No. M-180.) E. W. Weinman and A. L. Boegehold. OEMsr-1120; Project Nos. NRC-55 and OD-115; OSRD No. 3056. General Motors Corporation. December 28, 1943.
- M3** Heat treatment of National Emergency steels for use in tanks, combat cars, gun mounts and other ordnance materiel. (Progress Report No. M-277.) A. L. Boegehold and E. W. Weinman. OEMsr-1120; Project Nos. NRC-55 and OD-115; OSRD No. 3743. General Motors Corporation. June 1, 1944.
- M4** Heat treatment of National Emergency steels for use in tanks, combat cars, gun mounts and other ordnance materiel. (Final Report No. M-404.) E. W. Weinman and A. L. Boegehold. OEMsr-1120; Project Nos. NRC-55 and OD-115; OSRD No. 4386. General Motors Corporation. November 27, 1944.
- M5** Hardenability of cast steels for use in ordnance materiel. Part I, Mechanical properties and hardenability of heat-treated cast alloy steels. (Final Report No. M-541.) C. R. Wilks, Howard S. Avery and others. Research Project No. NRC-83A; OSRD No. 5439. American Brake Shoe and Foundry Company. August 9, 1945.

300

GUNS AND GUN STEELS

- M1** Indexing of Division 18, NDRC reports. Reports on gun steels. (Advisory Report No. M-650.) Katherine Forsyth. OEMsr-307; OSRD No. 6598. National Academy of Sciences. February 28, 1946.

301

Gun Tube Steel

- M1** Steel for gun tubes. (Report No. M-3.) Robert F. Mehl. NDCrc-120; Project Nos. B-160, OD-34 and PDRC-42; OSRD No. 490. Carnegie Institute of Technology. March 15, 1942.
- M2** Steel for gun tubes. Part IV, A final summary. (Final Report No. M-62.) Cyril Wells and Robert F. Mehl. NDCrc-120 and OEMsr-143; Project Nos. OD-34-3, B-90 and B-160; OSRD No. 1329. Carnegie Institute of Technology. April 5, 1943.

- M3** Acceptance tests for plain carbon steel gun forgings and other ordnance forgings. (Final Report No. M-466.) Robert F. Mehl and Arthur H. Grobe. OEMsr-956; Project Nos. NRC-58 and OD-114; OSRD No. 5018. Carnegie Institute of Technology. May 3, 1945.

301.1 Properties

- M1** Fatigue strength of selected gun steels under combined stress. Results of combined bending and torsion fatigue tests on SAE-X4340 steel. (Final Report No. M-61.) E. L. Eriksen and H. M. Hansen. OEMsr-152; Project Nos. B-189 and OD-34-10; OSRD No. 1523. University of Michigan. June 7, 1943.

301.2 Cracking and Fractures

- M1** Steel for gun tubes. Part I, The significance of angular fractures. (Final Report No. M-22.) Robert F. Mehl and Cyril Wells. NDCrc-120 and OEMsr-143; Project Nos. B-90, B-160 and OD-34-3; OSRD No. 1009. Carnegie Institute of Technology. November 23, 1942.

302 Wrought Gun Tubes

- M1** Steel for gun tubes. Part II, Acceptance tests for wrought gun tubes. (Final Report No. M-29.) Cyril Wells and Robert F. Mehl. NDCrc-120 and OEMsr-143; Project Nos. B-90, B-160 and OD-34-3; OSRD No. 1163. Carnegie Institute of Technology. January 22, 1943.

302.1 Manufacture (Basic Open Hearth)

- M1** Control of basic open hearth practice in manufacture of wrought gun tubes. (Progress Report No. M-94.) W. G. Hildorf, J. G. Mravec and John Welchner. OEMsr-909; Project Nos. NRC-50 and OD-34-3; OSRD No. 1742. Timken Roller Bearing Company. August 24, 1943.
- M2** Control of basic open hearth practice in manufacture of wrought gun tubes. (Progress Report No. M-142.) W. G. Hildorf, J. G. Mravec and John Welchner. OEMsr-909; Project Nos. NRC-50 and OD-34-3; OSRD No. 1972. Timken Roller Bearing Company. October 26, 1943.
- M3** Control of basic open hearth melting practice for the manufacture of wrought gun tubes. (Progress Report No. M-229.) W. G. Hildorf, J. G. Mravec and John Welchner. OEMsr-909; Project Nos. NRC-50 and OD-34-3; OSRD No. 3434. Timken Roller Bearing Company. March 20, 1944.
- M4** Control of basic open hearth melting practice for the manufacture of wrought gun tubes. (Final Report No. M-420.) J. G. Mravec, John Welchner and W. G. Hildorf. OEMsr-909; Project Nos. NRC-50 and OD-34-3; OSRD No. 4497. Timken Roller Bearing Company. December 19, 1944.

302.2 Ductility

- M1** Steel for gun tubes. Part III, The effect of

homogenization on the transverse ductility of wrought gun tubes. (Final Report No. M-43.) Cyril Wells and Robert F. Mehl. OEMsr-143 and NDCrc-120; Project Nos. B-90, B-160 and OD-34-3; OSRD No. 1207. Carnegie Institute of Technology. February 10, 1943.

- M2** Improvement in wrought gun tubes. Part V, Effect of forging reduction on average ductility. Reduction of area, transverse and longitudinal. (Final Report No. M-561.) Robert F. Mehl, Cyril Wells and C. V. Klimas. OEMsr-771; Project Nos. NRC-38 and OD-34-3; OSRD No. 5455. Carnegie Institute of Technology. August 16, 1945.

- M3** Improvement in wrought gun tubes. Part VI, Effect of reheat treatment (reheat and draw) and redraw on transverse ductility. (Final Report No. M-562.) Robert F. Mehl, Cyril Wells and others. OEMsr-771; Project Nos. NRC-38 and OD-34-3; OSRD No. 5476. Carnegie Institute of Technology. August 21, 1945.

- M4** Improvement in wrought gun tubes. Part VII, Effect of upsetting on average transverse ductility in seamless gun tubes. (Final Report No. M-563.) Robert F. Mehl, Cyril Wells and C. V. Klimas. OEMsr-771; Project Nos. NRC-38 and OD-34-3; OSRD No. 5477. Carnegie Institute of Technology. August 21, 1945.

302.3 Operating Characteristics of Specifications WVXS

- M1** Improvement in wrought gun tubes. Part I, Operating characteristics of specification WVXS-78. (Volumes I and II. Final Report No. M-537.) Cyril Wells, Robert F. Mehl and others. OEMsr-771; Project Nos. NRC-38 and OD-34-3; OSRD No. 5420. Carnegie Institute of Technology. August 6, 1945.
- M2** Improvement in wrought gun tubes. Part VIII, Operating characteristics of specification WVXS-88 and specification WVXS-95. (Final Report No. M-564.) Robert F. Mehl, Cyril Wells and C. V. Klimas. OEMsr-771; Project Nos. NRC-38 and OD-34-3; OSRD No. 6386. Carnegie Institute of Technology. December 5, 1945.

302.4 Tensile and Impact Properties

- M1** Improvement in wrought gun tubes. Part II, Effect of the angle of test, relative to fiber direction, on the tensile and impact properties of quenched and tempered steel forgings. (Final Report No. M-549.) Robert F. Mehl, Arthur H. Grobe and Cyril Wells. OEMsr-771; Project Nos. NRC-38 and OD-34-3; OSRD No. 5453. Carnegie Institute of Technology. August 16, 1945.
- M2** Improvement in wrought gun tubes. Part III, Linear correlations among the tensile and impact properties in quenched-out gun tubes. (Final Report No. M-556.) Robert F. Mehl, Cyril Wells and others. OEMsr-771; Project Nos. NRC-38 and OD-34-3; OSRD No. 5454. Carnegie Institute of Technology. August 16, 1945.

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302.5 Heat Treatment

- M1** An investigation of the metallographic and physical properties of new types of gun steels. (Progress Report No. M-130.) Alexander R. Troiano. OEMsr-724; Project Nos. OD-34-3 and NRC-36; OSRD No. 1840. University of Notre Dame. September 20, 1943.
- M2** An investigation of the metallographic and physical properties of new types of gun steels. (Final Report No. M-239.) Alexander R. Troiano. OEMsr-724; Project Nos. NRC-36 and OD-34-3; OSRD No. 3513. University of Notre Dame. April 10, 1944.
- M3** Prevention of cracking in gun tubes. (Final Report No. M-555.) Robert F. Mehl, Cyril Wells and others. OEMsr-1265; Project Nos. NRC-80 and OD-34-3; OSRD No. 5383. Carnegie Institute of Technology. July 30, 1945.
- M4** Time-temperature-hardness relations in new gun steels. (Final Report No. M-495.) G. R. Fitterer and William M. O'Donnell. OEMsr-1350; Project Nos. NRC-85 and OD-34-3; OSRD No. 5491. University of Pittsburgh. August 27, 1945.

302.6 Miscellaneous Wrought Gun Tube Problems

- M1** Improvement in wrought gun tubes. Yield strength in wrought gun tubes. (Progress Report No. M-146.) Cyril Wells and Robert F. Mehl. OEMsr-771; Project Nos. NRC-38 and OD-34-3; OSRD No. 1908. Carnegie Institute of Technology. October 8, 1943.
- M2** Improvement in wrought gun tubes. Part IV, Relation between transverse reduction of area and performance in six 37-mm M-6 gun tubes. (Final Report No. M-558.) Cyril Wells and Robert F. Mehl. OEMsr-771; Project Nos. NRC-38 and OD-34-3; OSRD No. 6385. Carnegie Institute of Technology. December 5, 1945.

303 Gun Steel Ingot Practices

- M1** Improvement in gun steel ingot practice. Classification of bore defects in seamless gun tubes. (Progress Report No. M-136. Revised.) Robert F. Mehl, K. L. Fitters and J. W. Spretnak. OEMsr-755; Project Nos. NRC-39 and OD-34-3; OSRD No. 5052. Carnegie Institute of Technology. Revised: March 20, 1944.
- M2** Improvement in gun steel ingot practices. Part I, Statistical and laboratory studies. (Final Report No. M-343.) Robert F. Mehl, J. W. Spretnak and C. F. Sawyer. OEMsr-755; Project Nos. NRC-39 and OD-34-3; OSRD No. 4122. Carnegie Institute of Technology. August 28, 1944.
- M3** Improvement in gun steel ingot practice. Part II, Plant experiments. (Final Report No. M-540.) Robert F. Mehl, J. W. Spretnak and C. F. Sawyer. OEMsr-755; Project Nos. NRC-39 and OD-34-3; OSRD No. 5438. Carnegie Institute of Technology. August 13, 1945.
- M4** Improvement in gun steel ingot practice. Part III,

Solidification of steel ingots. (Final Report No. M-557.) Robert F. Mehl and J. W. Spretnak. OEMsr-755; Project Nos. NRC-39 and OD-34-3; OSRD No. 5919. Carnegie Institute of Technology. September 24, 1945.

- M5** Improvement in gun steel ingot practice. Part IV, Firing tests on seamless gun tubes with bore defects. (Final Report No. M-550.) Robert F. Mehl, Cyril Wells and J. W. Spretnak. OEMsr-755; Project Nos. NRC-39 and OD-34-3; OSRD No. 5935. Carnegie Institute of Technology. September 25, 1945.

304 High-Strength Gun Steels

- M1** Development of high-strength gun steels. (Progress Report No. M-434.) D. L. Edlund. OEMsr-1286; Project Nos. NRC-81 and OD-34-3; OSRD No. 4457. Vanadium Corporation of America. December 12, 1944.
- M2** Development of high-strength gun steels. (Final Report No. M-649.) D. L. Edlund and T. L. Oberle. OEMsr-1286; Project Nos. NRC-81 and OD-34-3; OSRD No. 6597. Vanadium Corporation of America. February 28, 1946.

400 AMMUNITION**401 Armor-Piercing Capped Shot**

- M1** Investigation of the use of special non-alloy steels for armor-piercing capped shot. Part I, Results of experimental work with two heats of Grainal-treated carbon steel for production of 37-mm armor-piercing capped shot. (Final Report No. M-195.) John S. Jackson, Donald P. Buswell and others. OEMsr-969; Project Nos. NRC-37 and OD-107; OSRD No. 3110. General Motors Corporation. January 10, 1944.
- M2** Investigation of the use of special non-alloy steels for armor-piercing capped shot. Part II, Results of experimental work directed toward production of a projectile possessing superior ballistic properties. (Final Report No. M-256.) John S. Jackson, Donald P. Buswell and others. OEMsr-969; Project Nos. NRC-37 and OD-107; OSRD No. 3583. General Motors Corporation. April 15, 1944.

402 Cartridge Brass**402.1 Prevention of Stress-Corrosion Cracking**

- M1** Prevention of stress-corrosion cracking of cartridge brass. (Progress Report No. M-27.) E. A. Anderson, W. M. Peirce and others. OEMsr-645; Project Nos. NRC-27 and OD-25; OSRD No. 1038. New Jersey Zinc Company. December 10, 1942.
- M2** Prevention of stress-corrosion cracking of cartridge brass by protective coatings or surface treatment. (Progress Report No. M-54.) W. M. Peirce, E. A. Anderson and others. OEMsr-645; Project Nos. NRC-27 and OD-25; OSRD No. 1262. New Jersey Zinc Company. March 9, 1943.

- M3** Prevention of stress-corrosion cracking of cartridge brass by protective coatings or surface treatment. (Progress Report No. M-81.) W. M. Peirce, E. A. Anderson and others. OEMsr-645; Project Nos. NRC-27 and OD-25; OSRD No. 1440. New Jersey Zinc Company. May 17, 1943.
- M4** Prevention of stress-corrosion cracking of cartridge brass by protective coatings or surface treatment. (Progress Report No. M-133.) W. M. Peirce and E. A. Anderson. OEMsr-645; Project Nos. NRC-27 and OD-25; OSRD No. 1859. New Jersey Zinc Company. September 22, 1943.
- M5** Prevention of stress-corrosion cracking of cartridge brass by protective coatings or surface treatment. (Progress Report No. M-176.) W. M. Peirce and E. A. Anderson. OEMsr-645; Project Nos. NRC-27 and OD-25; OSRD No. 3006. New Jersey Zinc Company. December 7, 1943.
- M6** Prevention of stress-corrosion cracking of cartridge brass by protective coatings or surface treatment. (Final Report No. M-240.) E. A. Anderson and W. M. Peirce. OEMsr-645; Project Nos. NRC-27 and OD-25; OSRD No. 3534. New Jersey Zinc Company. April 3, 1944.
- M7** Prevention of stress-corrosion cracking of cartridge brass by protective coatings or surface treatment. (Final Report No. M-389. Supplement to Final Report No. M-240.) E. A. Anderson and W. M. Peirce. OEMsr-645; Project Nos. NRC-27 and OD-25; OSRD No. 4253. New Jersey Zinc Company. October 12, 1944.

402.2 Residual Stresses

- M1** Residual stresses in cold-drawn non-ferrous alloys. An X-ray study. (Part I. Final Report No. M-102.) H. V. Anderson and C. W. Tucker. OEMsr-208; Project Nos. B-220 and OD-25; OSRD No. 1633. Lehigh University. July 28, 1943.
- M2** Residual stresses in cold-drawn non-ferrous alloys. An X-ray study. (Part II. Final Report No. M-267.) C. W. Tucker, G. D. Nelson and others. OEMsr-208; Project Nos. B-220 and OD-25; OSRD No. 3599. Lehigh University. May 1, 1944.
- M3** Residual stresses in cold-drawn non-ferrous alloys. An X-ray study. (Part III. Final Report No. M-366.) C. W. Tucker, G. D. Nelson and H. V. Anderson. OEMsr-208; Project Nos. B-220 and OD-25; OSRD No. 4208. Lehigh University. October 4, 1944.
- M4** Residual stresses in cold-drawn non-ferrous alloys. An X-ray study. (Part IV. Final Report No. M-423.) C. W. Tucker, G. D. Nelson and H. V. Anderson. OEMsr-208; Project Nos. B-220 and OD-25; OSRD No. 4475. Lehigh University. December 11, 1944.
- M5** Residual stresses in cold-drawn non-ferrous alloys. An X-ray study. (Part V. Final Report No. M-482.) C. W. Tucker, G. D. Nelson and H. V. Anderson. OEMsr-208; Project Nos. B-220 and OD-25; OSRD No. 4764. Lehigh University. March 15, 1945.
- M6** Residual stresses in cold-drawn non-ferrous alloys.

An X-ray study. (Part VI. Final Report No. M-531.) C. W. Tucker, G. D. Nelson and H. V. Anderson. OEMsr-208; Project Nos. B-220 and OD-25; OSRD No. 5226. Lehigh University. June 18, 1945.

402.3 Density-Volume Changes

- M1** Density-volume changes associated with phase changes in cartridge brass. (Final Report No. M-217.) R. L. Dowdell. OEMsr-1084; Project Nos. NRC-62 and OD-117; OSRD No. 3624. University of Minnesota. May 13, 1944.

403 Driving Bands for Projectiles

- M1** Bi-metallic copper-steel driving bands for projectiles. Part I, Experimental driving bands for the naval 40-mm projectile. Part II, Centrifugal casting of duplex copper-steel tubing for driving bands. (Final Report No. M-297.) Lyall Zickrick, Alfred Boyles and A. E. Schuh. OEMsr-1048; Project Nos. NRC-60, NRC-26 and NO-159; OSRD No. 3885. General Electric Company and US Pipe and Foundry Company. July 11, 1944.
- M2** Bi-metallic copper-steel driving bands for projectiles. (Part III. Final Report No. M-388.) Lyall Zickrick. OEMsr-1048; Project Nos. NRC-60 and NO-159; OSRD No. 5118. General Electric Company. May 24, 1945.

403.1 Foreign

- M1** Material and placement of German rotating bands. Technical Report No. 394-45.) R. T. Wright. US Naval Technical Mission in Europe. August, 1945.

500 METALS FOR HIGH-TEMPERATURE SERVICE

501 Properties

- M1** Properties of sheet materials for high-temperature service. (Advisory Report No. M-655.) Howard C. Cross. OEMsr-307; Survey Project No. SP-31; OSRD No. 6602. National Academy of Sciences. March 15, 1946.

502 Gas Turbines and Turbo-Superchargers

502.1 Heat-Resisting Metals

- M1** Compilation of current data on selected alloys suitable for high-temperature service in gas turbine and supercharger parts. (Report No. M-12.) Howard C. Cross, W. C. Stewart and W. J. McCann. OEMsr-307; Service Project No. N-102; OSRD No. 722. National Academy of Sciences. July 22, 1942.
- M2** Heat-resisting metals for gas turbine parts. (Progress Report No. M-16.) Howard C. Cross. Project Nos. NRC-8 and N-102; OSRD No. 939. War Metallurgy Committee. October 7, 1942.
- M3** Heat-resisting metals for gas turbine parts. (Progress Report No. M-60.) Howard C. Cross. Project

- Nos. NRC-8, NRC-41 and N-102; OSRD No. 1337. War Metallurgy Committee. April 12, 1943.
- M4** Heat-resisting metals for gas turbine parts. (Progress Report No. M-147.) Howard C. Cross. Project Nos. NRC-8, NRC-41 and N-102; OSRD No. 1871. War Metallurgy Committee. October 1, 1943.
- M5** Survey of data on alloys developed for turbo-supercharger and gas turbine applications. (Advisory Report No. M-178.) Richard F. Miller and Howard C. Cross. OEMsr-478; OEMsr-447 and others; Project Nos. NRC-8 and N-102; OSRD No. 3042. American Brake Shoe and Foundry Company, Battelle Memorial Institute and others. December 27, 1943.
- M6** Heat-resisting metals for gas turbine parts. (Progress Report No. M-280.) Howard C. Cross and Ward F. Simmons. OEMsr-447; OEMsr-478 and others; Project Nos. NRC-8 and N-102; OSRD No. 3651. Battelle Memorial Institute, American Brake Shoe and Foundry Company and others. May 10, 1944.
- M7** Machining data on heat-resisting metals for gas turbine parts. (Progress Report No. M-451.) Howard C. Cross. OEMsr-447; Project Nos. NRC-8 and N-102; OSRD No. 4554. Battelle Memorial Institute. January 10, 1945.
- M8** Heat-resisting metals for gas turbine parts. (Progress Report No. M-477.) Howard C. Cross and Ward F. Simmons. OEMsr-447, OEMsr-478 and others; Project Nos. NRC-8 and N-102; OSRD No. 4717. Battelle Memorial Institute, American Brake Shoe and Foundry Company and others. February 20, 1945.
- M9** Heat-resisting metals for gas turbine parts. A metallurgical investigation of a large forged disc of low-carbon N-155 alloy. (Final Report No. M-617.) J. W. Freeman and Howard C. Cross. OEMsr-466, OEMsr-478 and others. Project Nos. NRC-8 and N-102; OSRD No. 6427. University of Michigan, American Brake Shoe and Foundry Company and others. August 4, 1945.
- M10** Heat-resisting metals for gas turbine parts. Experimental alloys for high-temperature service. (Final Report No. M-657.) D. L. Edlund and T. L. Oberle. OEMsr-527; Project Nos. NRC-8 and N-102; OSRD No. 6564. Vanadium Corporation of America. January 21, 1946.
- M11** Heat-resisting metals for gas turbine parts. (Final Report No. M-636.) Howard C. Cross and Ward F. Simmons. OEMsr-447, OEMsr-478 and others; Project Nos. NRC-8, NRC-41 and N-102; OSRD No. 6563. Battelle Memorial Institute, American Brake Shoe and Foundry Company and others. January 21, 1946.
- 502.11 Chromium-Base Alloys**
- M1** Heat-resisting metals for gas turbine parts. Chromium-base alloys. (Progress Report No. M-510.) Robert M. Parke. OEMsr-457; Project Nos. NRC-8 and N-102; OSRD No. 5044. Climax Molybdenum Company. May 7, 1945.
- M2** Heat-resisting metals for gas turbine parts. Chromium-base alloys. (Final Report No. M-656.) Robert M. Parke and Alvin J. Herzig. OEMsr-457; Project Nos. NRC-8 and N-102; OSRD No. 6547. Climax Molybdenum Company. January 21, 1946.
- 502.12 Damping**
- M1** Damping capacity of heat-resisting metals for gas turbine parts. (Progress Report No. M-260.) T. E. Pochapsky and W. J. Mase. OEMsr-447; Project Nos. NRC-8 and N-102; OSRD No. 3549. Battelle Memorial Institute. April 15, 1944.
- M2** Bibliography on the damping of metals. (Advisory Report No. M-659.) Howard C. Cross. OEMsr-307; Survey Project No. SP-33; OSRD No. 6603. National Academy of Sciences. February 20, 1946.
- 502.13 Precision Casting**
- M1** Experimental production of pilot static and centrifugal castings for the armed services. Part II, Precision casting of gas turbine diaphragms. (Final Report No. M-509.) Raymond H. Schaefer, James L. Hall and others. Project No. NRC-61A; OSRD No. 5333. American Brake Shoe and Foundry Company. July 12, 1945.
- 503 Heat-Resistant Alloys for Ordnance, Aircraft and Naval Engine Parts**
- M1** Heat-resistant alloys for ordnance materiel and aircraft and naval engine parts. Part I, Heat-resistant alloys of the 21 percent chromium [and] 9 percent nickel type. (Final Report No. M-496.) Howard S. Avery and Earnshaw Cook. Project Nos. NRC-84-A and N-102; OSRD No. 5263. American Brake Shoe and Foundry Company. June 29, 1945.
- M2** Heat-resistant alloys for ordnance materiel and aircraft and naval engine parts. Part II, Cobalt and nickel in 26 percent chromium alloys. (Final Report No. M-516.) F. S. Gardner, Howard S. Avery and Earnshaw Cook. Project Nos. NRC-84-A and N-102; OSRD No. 5334. American Brake Shoe and Foundry Company. July 12, 1945.
- 504 Weldability of Heat-Resisting Alloys**
- M1** Weldability of heat-resisting alloys. (Final Report No. M-626.) A. L. Feild, F. K. Bloom and G. E. Linnert. OEMsr-1466; Project Nos. NRC-90 and N-102; OSRD No. 6389. Rustless Iron and Steel Corporation. December 5, 1945.
- 505 Metal and Ceramic Materials for Jet-Propulsion Devices**
- M1** Metal and ceramic materials for jet-propulsion devices. (Final Report No. M-648.) Howard C. Cross. OEMsr-1345; Project Nos. NRC-88 and

AC-75; OSRD No. 6571. Battelle Memorial Institute. January 31, 1946.

- 600 WELDING**
- M1** Indexing of Division 18, NDRC reports. Reports on the welding of armor plate, ordnance and structural steels issued during the period of 1942 to 1944. (Progress Report No. M-481.) Ralph H. Phelps and Helen L. Purdum. OEMsr-307; OSRD No. 5047. National Academy of Sciences. May 9, 1945.
- 601 Armor and Ordnance Welding**
- M1** Studies and investigations in connection with research needs in the field of welding ordnance steels. (Report No. M-1.) R. H. Aborn and J. R. Stitt. OEMsr-68; Research Project No. B-150; OSRD No. 479. Ohio State University. January 15, 1942.
- M2** Survey of literature and industrial practice in the welding of armor. (Report No. M-5.) R. H. Aborn, Hugo W. Hiemke and J. R. Stitt. OEMsr-68; Research Project No. B-150; OSRD No. 582. Ohio State University. April 30, 1942.
- M3** Survey of literature and industrial data on dilation characteristics of alloy steels used in ordnance and their significance in welding. (Report No. M-8.) J. R. Stitt and William R. Chedsey. OEMsr-68; Project Nos. B-150, OD-37-1 and OD-37-2; OSRD No. 771. Ohio State University. July 20, 1942.
- 601.1 Arc Welding**
- M1** Metallurgical factors of underbead cracking. (Technical Publication No. 1847.) S. L. Hoyt, C. E. Sims and H. M. Banta. American Institute of Mining and Metallurgical Engineers. June, 1945.
- 601.11 Face-Hardened Armor Plate**
- M1** Survey of literature and industrial practice on precipitation hardening alloys in armor welding. (Report No. M-7.) J. R. Stitt and William R. Chedsey. OEMsr-68; Project Nos. B-150, OD-36-2 and OD-36-3; OSRD No. 770. Ohio State University. July 20, 1942.
- M2** The development of a process for manufacturing and welding face-hardened armor plate. (Final Report No. M-290.) R. B. Schenck, John S. Jackson and others. OEMsr-970; Project Nos. NRC-24 and OD-74; OSRD No. 3912. General Motors Corporation. July 20, 1944.
- M3** The welding of face-hardened armor. (Final Report No. M-304.) Paul C. Cunnick, J. K. McDowell and others. Project Nos. OD-74 and NRC-16R; OSRD No. 4081. Rock Island Arsenal. August 21, 1944.
- 601.12 Back-Up Strips**
- M1** Non-metallic welding back-up strips for armor plate joints. (Progress Report No. M-159.) C. R.

- Austin, S. L. Hoyt and others. OEMsr-979; Project Nos. OD-82 and NRC-59; OSRD No. 2080. Battelle Memorial Institute. November 23, 1943.
- M2** Non-metallic welding back-up strips for armor plate joints. (Progress Report No. M-200.) S. L. Hoyt, C. B. Voldrich and others. OEMsr-979; Project Nos. OD-82 and NRC-59; OSRD No. 3238. Battelle Memorial Institute. February 7, 1944.
- M3** Non-metallic back-up strips for armor plate joints. (Final Report No. M-220.) S. L. Hoyt, C. B. Voldrich and others. OEMsr-979; Project Nos. OD-82 and NRC-59; OSRD No. 3398. Battelle Memorial Institute. March 13, 1944.
- 601.13 Electrodes**
- 601.131 Armor-Welding Electrodes**
- M1** Development of armor-welding electrodes. Tests of Coast Metals, Inc. electrodes. (Progress Report No. M-15.) Everett C. Chapman. OEMsr-535; Project Nos. NRC-2 and OD-36-2; OSRD No. 918. Combustion Engineering Company, Inc. October 1, 1942.
- M2** Development of armor-welding electrodes. Relation of the composition of austenitic (20 Cr-10 Ni) electrodes to the physical and ballistic properties of armor weldments. (Progress Report No. M-101.) A. L. Feild, F. K. Bloom and G. E. Linnert. Project Nos. NRC-2 and OD-36-2; OSRD No. 1636. Rustless Iron and Steel Corporation. July 20, 1943.
- M3** Survey of activity relative to the application of large-diameter austenitic electrodes to the welding of armor. (Advisory Report No. M-109.) G. S. Mikhalapov and J. H. Humberstone. OEMsr-307; Service Project Nos. OD-82 and OD-36-2; OSRD No. 1657. National Academy of Sciences. July 29, 1943.
- M4** Armor-welding electrodes. Part I, Development of ferritic electrodes for welding of armor plate. Part II, Additional tests of ferritic armor-welding electrodes. (Special Progress Report No. M-97.) Everett C. Chapman, G. S. Mikhalapov and others. OEMsr-535 and OEMsr-307; Project Nos. NRC-22 and OD-36-2; OSRD No. 1744. Combustion Engineering Company, Inc. and National Academy of Sciences. August 16, 1943.
- M5** Development of armor-welding electrodes. The effect of variations in chromium-nickel ratio and molybdenum content of austenitic (20 Cr-10 Ni) electrodes on properties of armor weldments. (Progress Report No. M-182.) A. L. Feild, F. K. Bloom and G. E. Linnert. Project Nos. NRC-2R and OD-36-2; OSRD No. 3034. Rustless Iron and Steel Corporation. December 14, 1943.
- M6** Armor-welding electrodes and weldability of commercial armor plate. Welding of experimental H-plates with manganese-molybdenum electrodes. (Advisory Report No. M-185.) G. S. Mikhalapov, C. H. Jennings and J. H. Humberstone. OEMsr-

307; Project Nos. NRC-1 and OD-82; OSRD No. 3057. National Academy of Sciences. December 30, 1943.

- M7** Development of armor-welding electrodes. Influence of the type of armor plate on the properties of armor weldments. (Final Report No. M-259.) A. L. Feild, F. K. Bloom and G. E. Linnert. Project Nos. NRC-2R and OD-36-2; OSRD No. 3641. Rustless Iron and Steel Corporation. May 6, 1944.

- M8** Suggested specification for ferritic armor-welding electrode, Type NRC-2A. (Advisory Report No. M-345.) G. S. Mikhlapov and J. H. Humberstone. OEMsr-307; Project Nos. NRC-2A and OD-36-2; OSRD No. 4060. National Academy of Sciences. August 17, 1944.

- M9** Weldability of commercial armor plate and development of armor-welding electrodes. Part I, The welding of experimental H-plates with NRC-2A type ferritic electrodes. Part II, The welding of an M-5 tank hull with NRC-2A ferritic electrodes. (Advisory Report No. M-507.) A. Mueller and H. J. Zoog. OEMsr-307; Project Nos. NRC-1 and OD-82; OSRD No. 5102. National Academy of Sciences. May 23, 1945.

- M10** Development of armor-welding electrodes. Effect of time and temperature of aging treatment on the physical properties of NRC-2A metal. (Advisory Report No. M-520.) C. D. Evans. OEMsr-307; Project Nos. NRC-2 and OD-36-2; OSRD No. 5143. National Academy of Sciences. June 15, 1945.

- M11** Development of armor-welding electrodes. Part I, Ferritic electrodes for welding of rolled armor plate. Part II, Ferritic electrodes for welding of cast armor. (Final Report No. M-643.) Everett C. Chapman and R. E. Lorentz, Jr. OEMsr-535; Project Nos. NRC-2 and OD-36-2; OSRD No. 6592. Combustion Engineering Company, Inc. February 11, 1946.

- M12** Field service in the welding of high-strength structural steel and in the repair welding of cast armor. (Advisory Report No. M-645.) H. J. Zoog. OEMsr-307; Project Nos. NRC-76 and OD-36-2; OSRD No. 6594. National Academy of Sciences. February 22, 1946.

601.132 Electrode Coatings

- M1** Development of improved electrode coatings. (Progress Report No. M-371.) C. B. Voldrich, P. J. Rieppel and others. OEMsr-1270; Project Nos. NRC-76 and OD-36-2; OSRD No. 4394. Battelle Memorial Institute. November 12, 1944.

- M2** Development of improved electrode coatings. (Progress Report No. M-500.) P. J. Rieppel, M. W. Mallett and others. OEMsr-1270; Project Nos. NRC-76 and OD-36-2; OSRD No. 5101. Battelle Memorial Institute. May 19, 1945.

- M3** Development of improved electrode coatings.

Part I, Fundamentals of weld metal porosity. (Final Report No. M-627.) P. J. Rieppel, M. W. Mallett and others. OEMsr-1270; Project Nos. NRC-76 and OD-36-2; OSRD No. 6549. Battelle Memorial Institute. January 22, 1946.

- M4** Development of improved electrode coatings. Part II, Development of alternating current-welding electrodes for high-strength structural use. (Final Report No. M-628.) C. B. Voldrich, D. C. Martin and H. W. Russell. OEMsr-1270; Project Nos. NRC-76 and OD-36-2; OSRD No. 6550. Battelle Memorial Institute. January 22, 1946.

601.133 Ferritic Electrodes

- M1** Weldability of commercial armor plate. Post-ballistic comparison of manganese-molybdenum ferritic electrodes within and without the NRC-2A specification. (Progress Report No. M-640.) W. G. Benz, R. F. Campbell and others. OEMsr-552; Project Nos. NRC-1 and OD-82; OSRD No. 6585. Federal Shipbuilding and Dry Dock Company. February 6, 1946.

- M2** Weldability of commercial armor plate. Post-ballistic examination of 0.5 inch H-plate manually welded with NRC-2A type ferritic electrode. (Progress Report No. M-635.) W. G. Benz, R. F. Campbell and others. OEMsr-552; Project Nos. NRC-1 and OD-82; OSRD No. 6583. Federal Shipbuilding and Dry Dock Company. February 6, 1946.

601.134 Austenitic Electrodes

- M1** Weldability of commercial armor plate. Investigation of welded H-plates from the 1942-1943 Canadian cold test. Part II, H-plates manually welded with austenitic Cr-Ni-Mn electrodes. (Progress Report No. M-298.) A. P. Gagnebin and L. L. Seigle. OEMsr-552; Project Nos. NRC-1 and OD-82; OSRD No. 3819. Federal Shipbuilding and Dry Dock Company. June 14, 1944.

- M2** Weldability of commercial armor plate. Investigation of welded H-plates from the 1942-1943 Canadian cold test. Part III, H-plates manually welded with austenitic Cr-Ni-Mn electrodes. (Progress Report No. M-369.) O. O. Miller and R. H. Aborn. OEMsr-552; Project Nos. NRC-1 and OD-82; OSRD No. 4165. Federal Shipbuilding and Dry Dock Company. September 23, 1944.

601.14 Direct Explosion Test

- M1** Direct explosion test for welded armor plate. (Progress Report No. M-41.) W. O. Snelling. OEMsr-712; Project Nos. NRC-25 and OD-76; OSRD No. 1206. Trojan Powder Company. February 10, 1943.

- M2** Direct explosion test for welded armor plate. Part I, Development of direct explosion test equipment and procedure. Part II, Analysis of explosion test data. (Progress Report No. M-163.) W. O.

Snelling, G. S. Mikhalapov and C. H. Jennings. OEMsr-712 and OEMsr-307; Project Nos. NRC-25 and OD-76; OSRD No. 2083. Trojan Powder Company and National Academy of Sciences. November 23, 1943.

- M3** Direct explosion test for welded armor and ship plate. Part I, Armor plate. (Final Report No. M-446.) W. A. Snelling and W. O. Snelling. OEMsr-712; Project Nos. NS-255, NRC-25 and OD-76; OSRD No. 4655. Trojan Powder Company. January 23, 1945.

- M4** Direct explosion test for welded armor and ship plate. Part II, Prime and welded plate. (Final Report No. M-622.) W. A. Snelling and W. O. Snelling. OEMsr-712; Project Nos. NRC-25 and NS-255; OSRD No. 6382. Trojan Powder Company. December 5, 1945.

601.15 Stress Relief

- M1** Evaluation and relief of residual stresses in welded ordnance structures. (Report No. M-9.) J. R. Stitt and William R. Chedsey. OEMsr-68; Project Nos. B-150, OD-34-1 and OD-34-2; OSRD No. 814. Ohio State University. July 29, 1942.
- M2** Weldability of commercial armor plate. The influence of thermal stress relief on the hardness of five types of 1½-inch rolled armor. (Progress Report No. M-73.) R. H. Aborn and R. E. Brien. OEMsr-552; Project Nos. NRC-1 and OD-82; OSRD No. 1468. Federal Shipbuilding and Dry Dock Company. May 14, 1943.
- M3** Stress relief of weldments for machining stability. (Part I. Final Report No. M-172.) J. R. Stitt. OEMsr-399; Project Nos. NRC-3 and OD-34-2; OSRD No. 3032. Ohio State University. December 22, 1943.
- M4** Stress relief of welded joints. (Final Report No. M-230.) Paul C. Cunnick and J. K. McDowell. Project Nos. NRC-17R and OD-34-2; OSRD No. 3406. Rock Island Arsenal. March 15, 1944.
- M5** Stress relief of weldments for machining stability. (Part II. Final Report No. M-379.) J. R. Stitt. OEMsr-399; Project Nos. NRC-3 and OD-34-2; OSRD No. 4198. Ohio State University. September 29, 1944.

601.16 Locked-Up Stresses

- M1** Effect of locked-up stresses on ballistic performances of welded armor. (Part I. Final Report No. M-244.) Daniel Rosenthal, J. R. Clark and others. OEMsr-877; Project Nos. NRC-53 and OD-106; OSRD No. 3580. Massachusetts Institute of Technology. April 18, 1944.
- M2** Effect of locked-up stresses on ballistic performance of welded armor. Investigation of the stress distribution across the thickness of weld. (Progress Report No. M-392.) John T. Norton, Daniel Rosenthal and S. B. Maloof. OEMsr-877; Project Nos. NRC-53 and OD-106; OSRD No. 4395.

Massachusetts Institute of Technology. November 24, 1944.

- M3** Effect of locked-up stresses on ballistic performance of welded armor. (Part II. Final Report No. M-421.) John T. Norton, Daniel Rosenthal and S. B. Maloof. OEMsr-877; Project Nos. NRC-53 and OD-106; OSRD No. 4396. Massachusetts Institute of Technology. November 24, 1944.

601.17 Weldability

- M1** Guide to weldability of steels. (Report No. M-53.) (n.a.) OEMsr-307; OSRD No. 1276. National Academy of Sciences. March 11, 1943.
- M2** Evaluation of weldability by direct measurement of cooling rates. The measurement of cooling rates associated with arc welding and their application to the selection of optimum welding conditions. (Final Report No. M-68.) Wendell F. Hess, L. L. Merrill and others. OEMsr-396; Project Nos. NRC-10 and OD-37-1; OSRD No. 1405. Rensselaer Polytechnic Institute. April 30, 1943.
- M3** Evaluation of weldability by correlation of electrical and heat constants. Determination of cooling curves and analysis of heat transfer in arc welding of plates. (Final Report No. M-92.) Victor Paschik. OEMsr-494; Project Nos. NRC-11 and OD-37-1; OSRD No. 1550. Columbia University. June 28, 1943.
- M4** Methods of testing weldability of steel plates and shapes. (Part II. Final Report No. M-398.) R. D. Stout, S. S. Tör and others. OEMsr-1064; Research Project No. NRC-66; OSRD No. 4529. Lehigh University. January 2, 1945.

601.171 Commercial Armor Plate

- M1** Weldability of commercial armor plate. Part I, The evaluation of welding procedure and technique in terms of ballistic tests. Part II, Investigation of the ballistic response of ferritic welds. (Progress Report No. M-45.) G. S. Mikhalapov, R. H. Aborn and others. OEMsr-552; Project Nos. NRC-1 and OD-82; OSRD No. 1165. Federal Shipbuilding and Dry Dock Company. January 26, 1943.
- M2** Weldability of commercial armor plate. A preliminary investigation of residual stress in a welded H-plate. (Progress Report No. M-232.) R. H. Pierce, Jr., W. G. Benz and R. H. Aborn. OEMsr-552; Project Nos. NRC-1 and OD-82; OSRD No. 3348. Federal Shipbuilding and Dry Dock Company. March 8, 1944.
- M3** Weldability of commercial armor plate. Investigation of welded H-plates from the 1942-1943 Canadian cold test. Part I, H-plates welded by the Unionmelt process. (Progress Report No. M-265.) R. H. Aborn. OEMsr-552; Project Nos. NRC-1 and OD-82; OSRD No. 3514. Federal Shipbuilding and Dry Dock Company. April 20, 1944.

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- M4** Weldability of commercial armor plate. Isothermal transformation diagram of NRC-2A weld metal. (Progress Report No. M-435.) O. O. Miller, F. C. Kristufek and R. H. Aborn. OEMsr-552; Project Nos. NRC-1 and OD-82; OSRD No. 4478. Federal Shipbuilding and Dry Dock Company. December 19, 1944.
- M5** Weldability of commercial armor plate. Development of ferritic weld metal for repair of thick cast armor. Part I, Investigation of thirteen preliminary experimental weld metals. (Progress Report No. M-631.) O. O. Miller, F. C. Kristufek and R. H. Aborn. OEMsr-552; Project Nos. NRC-1 and OD-36-2; OSRD No. 6366. Federal Shipbuilding and Dry Dock Company. December 5, 1945.
- M6** Weldability of commercial armor plate. (Final Report No. M-642.) O. O. Miller, W. G. Benz and others. OEMsr-552; Project Nos. NRC-1, OD-82 and OD-36-2; OSRD No. 6567. Federal Shipbuilding and Dry Dock Company. January 15, 1946.
- M7** Weldability of commercial armor plate. Development of ferritic weld metal for repair of thick cast armor. Part II, Experimental weld metals for repair of 6-inch armor. (Progress Report No. M-641.) O. O. Miller, F. C. Kristufek and others. OEMsr-552; Project Nos. NRC-1 and OD-36-2; OSRD No. 6584. Federal Shipbuilding and Dry Dock Company. February 6, 1946.
- M8** Weldability of commercial armor plate. Isothermal and cooling transformation diagrams of NRC-2A weld metal. (Progress Report No. M-658.) O. O. Miller, F. C. Kristufek and R. H. Aborn. OEMsr-552; Project Nos. NRC-2A and OD-82; OSRD No. 6586. Federal Shipbuilding and Dry Dock Company. February 6, 1946.

601.172 Direct Welding Tests

- M1** Evaluation of weldability by direct welding tests. (Final Report No. M-64.) Gilbert E. Doan, John H. Frye, Jr. and others. OEMsr-445; Project Nos. NRC-9 and OD-37-1; OSRD No. 1427. Lehigh University. April 30, 1943.
- M2** Evaluation of weldability by direct welding tests. The quantitative measurement of welding response by bead welds. (Report No. M-201. Supplement to Final Report No. M-64.) Gilbert E. Doan, R. D. Stout and S. S. Tör. OEMsr-445; Project Nos. NRC-9 and OD-37-1; OSRD No. 3537. Lehigh University. April 7, 1944.

601.173 Oxygen Cutting

- M1** Effect of oxygen cutting on weldability of armor plate. (Progress Report No. M-285.) F. C. Saacke, F. N. Stone and others. OEMsr-1187; Project Nos. NRC-71 and OD-136; OSRD No. 3915. Air Reduction Company, Inc. June 16, 1944.
- M2** Effect of oxygen cutting on weldability of armor plate. (Final Report No. M-633.) F. C. Saacke,

C. J. Sullivan and J. J. Crowe. OEMsr-1187; Project Nos. NRC-71 and OD-136; OSRD No. 6570. Air Reduction Company, Inc. January 29, 1946.

601.174 Crack Sensitivity

- M1** Evaluation of factors affecting crack sensitivity of welded joints. Part I, The effect of welding variables and restraint upon the stresses produced in arc-welded joints. (Final Report No. M-352.) Wendell F. Hess, E. F. Nippes, Jr. and others. OEMsr-1030; Research Project No. NRC-65; OSRD No. 4383. Rensselaer Polytechnic Institute. November 13, 1944.
- M2** Evaluation of factors affecting crack sensitivity of welded joints. Part II, Measurements of stresses at the threshold of cracking of first-pass weld metal. (Final Report No. M-455.) Wendell F. Hess, E. F. Nippes, Jr. and A. P. Bunk. OEMsr-1030; Research Project No. NRC-65; OSRD No. 4900. Rensselaer Polytechnic Institute. April 5, 1945.

601.2 Flash Welding

601.21 Welding of Aluminum

- M1** Flash welding of aluminum. (Advisory Report No. M-393.) C. B. Smith. OEMsr-307; Survey Project No. SP-23; OSRD No. 4397. National Academy of Sciences. November 17, 1944.

601.22 Welding of Alloy Steels for Ordnance

- M1** Flash welding of alloy steels for ordnance. (Progress Report No. M-79.) H. W. Gillett, C. B. Voldrich and R. W. Bennett. OEMsr-451; Project Nos. NRC-13 and OD-86; OSRD No. 1514. Battelle Memorial Institute. June 4, 1943.
- M2** Flash welding of alloy steels for ordnance. (Progress Report No. M-115.) H. W. Gillett, C. B. Voldrich and R. W. Bennett. OEMsr-451; Project Nos. NRC-13 and OD-86; OSRD No. 1759. Battelle Memorial Institute. August 30, 1943.
- M3** Flash welding of alloy steels for ordnance. (Progress Report No. M-227.) H. W. Gillett, C. B. Voldrich and R. W. Bennett. OEMsr-451; Project Nos. NRC-13 and OD-86; OSRD No. 3424. Battelle Memorial Institute. March 23, 1944.
- M4** Flash welding of alloy steels for ordnance. (Progress Report No. M-258.) C. B. Voldrich, R. W. Bennett and others. OEMsr-451; Research Project No. NRC-13; OSRD No. 3675. Battelle Memorial Institute. April 22, 1944.
- M5** Flash welding of alloy steels for ordnance. (Progress Report No. M-271.) C. B. Voldrich, R. W. Bennett and P. J. Rieppel. OEMsr-451; Research Project No. NRC-13; OSRD No. 3689. Battelle Memorial Institute. May 10, 1944.
- M6** Flash welding of alloy steels for ordnance. Part I, Controlled atmospheres. (Final Report No. M-440.) C. B. Voldrich, R. W. Bennett and H. W. Gillett.

OEMsr-451; Project Nos. NRC-13 and OD-86; OSRD No. 4654. Battelle Memorial Institute. January 29, 1945.

- M7** Flash welding of alloy steels for ordnance. Part II, Translation of: Production technique and quality of flash-welded joints, by Hans Kilger. (Final Report No. M-458.) S. L. Hoyt, N. Baklonoff and R. W. Bennett. OEMsr-451; Project Nos. NRC-13 and OD-86; OSRD No. 4786. Battelle Memorial Institute. (n.d.)

601.23 Non-Destructive Testing

- M1** Non-destructive testing of flashwelds. (Progress Report No. M-173.) J. F. Manildi, R. C. McMaster and others. OEMsr-974; Project Nos. NRC-57 and OD-86; OSRD No. 3210. California Institute of Technology. January 28, 1944.
- M2** Non-destructive testing of flashwelds. The eddy current test. (Progress Report No. M-305.) J. F. Manildi, H. H. C. Chang and R. C. McMaster. OEMsr-974; Project Nos. NRC-57 and OD-86; OSRD No. 4140. California Institute of Technology. September 8, 1944.
- M3** Non-destructive testing of flashwelds. Preliminary results of magnetic retentivity tests. (Progress Report No. M-291.) J. F. Manildi, C. C. Woolsey and others. OEMsr-974; Project Nos. NRC-57 and OD-86; OSRD No. 4144. California Institute of Technology. September 8, 1944.
- M4** Non-destructive testing of flashwelds. (Final Report No. M-413.) J. F. Manildi, R. C. McMaster and others. OEMsr-974; Project Nos. NRC-57 and OD-86; OSRD No. 4404. California Institute of Technology. November 30, 1944.

601.3 Spot Welding

601.31 Magnesium Alloys

- M1** Spot welding of magnesium alloys. Part I, The surface treatment of magnesium alloy sheet for spot welding. (Final Report No. M-374.) Wendell F. Hess, T. B. Cameron and D. J. Ashcraft. OEMsr-1062; Research Project No. NRC-68; OSRD No. 4955. Rensselaer Polytechnic Institute. April 21, 1945.
- M2** Spot welding of magnesium alloys. Part II, Spot welding characteristics of chemically-cleaned magnesium alloy sheet. (Final Report No. M-375.) Wendell F. Hess, T. B. Cameron and others. OEMsr-1062; Research Project No. NRC-68; OSRD No. 4956. Rensselaer Polytechnic Institute. April 21, 1945.

601.32 Armor Plate and Low-Alloy Steels

- M1** Spot welding of armor plate and low-alloy steels. Part I, The fundamentals of spot-welding steel plate. (Final Report No. M-331.) Wendell F. Hess, A. Muller and others. OEMsr-391; Project Nos. NRC-12 and OD-85; OSRD No. 4336. Rensselaer Polytechnic Institute. October 28, 1944.

- M2** Spot welding of armor plate and low-alloy steels. Part II, The spot welding of attachments to armor. (Final Report No. M-332.) Wendell F. Hess, A. Muller and others. OEMsr-391; Project Nos. NRC-12 and OD-85; OSRD No. 4337. Rensselaer Polytechnic Institute. October 28, 1944.

601.33 Radiographic and Fluoroscopic Inspection in Aluminum Alloys

- M1** Radiographic and fluoroscopic methods of inspection of spot welds in aluminum alloys. (Part I. Final Report No. M-168.) C. C. Woolsey, L. P. Gaard and others. OEMsr-973; Research Project No. NRC-56; OSRD No. 3827. California Institute of Technology. June 20, 1944.
- M2** Radiographic and fluoroscopic methods of inspection of spot welds in aluminum alloys. (Part II. Final Report No. M-380.) R. C. McMaster, L. P. Gaard and others. OEMsr-973; Research Project No. NRC-56; OSRD No. 4620. California Institute of Technology. January 22, 1945.

602 Ship Welding and Welded Steel Ships

602.1 Residual and Locked-Up Stresses

- M1** Residual stresses in ship welding. (Progress Report No. M-190.) E. Paul De Garmo, Finn Jonassen and J. L. Meriam. OEMsr-1071; Research Project No. NRC-64; OSRD No. 3176. University of California. January 14, 1944.
- M2** Residual stresses in ship welding. (Progress Report No. M-266.) E. Paul De Garmo, Finn Jonassen and J. L. Meriam. OEMsr-1071; Research Project No. NRC-64; OSRD No. 3698. University of California. May 24, 1944.
- M3** Residual stresses in ship welding. (Progress Report No. M-370.) E. Paul De Garmo, J. L. Meriam and Finn Jonassen. OEMsr-1071; Project Nos. NRC-64 and NS-304; OSRD No. 4388. University of California. November 13, 1944.
- M4** History of residual stresses in welded ships. Part I, Ship hulls of Liberty and oil tanker types. (Final Report No. M-445.) E. D. Howe, A. Boodberg and Morrough P. O'Brien. OEMsr-1217; Project Nos. NRC-74 and NS-305; OSRD No. 4866. University of California. March 19, 1945.
- M5** Residual stresses in ship welding. (Final Report No. M-463.) E. Paul De Garmo and J. L. Meriam. OEMsr-1071; Project Nos. NRC-64 and NS-304; OSRD No. 4867. University of California. March 29, 1945.
- M6** History of residual stresses in welded ships. Part II, Hogging and sagging tests of oil tankers. (Final Report No. M-494.) E. D. Howe, A. Boodberg and Morrough P. O'Brien. OEMsr-1217; Project Nos. NRC-74 and NS-305; OSRD No. 5262. University of California. July 2, 1945.
- M7** History of residual stresses in welded ships. Part III, Tests of two Liberty ships at sea. (Final Report No. M-586.) E. D. Howe, A. Boodberg and others.

OEMsr-1217; Project Nos. NRC-74 and NS-305; OSRD No. 6359. University of California. November 28, 1945.

- M8** History of residual stresses in welded ships. Part IV, Hogging and sagging tests of an oil tanker and stress measurements on Type C-4 troopships. (Report No. M-623.) E. D. Howe, A. Boodberg and Morrough P. O'Brien. OEMsr-1217; Project Nos. NRC-74 and NS-305; OSRD No. 6587. University of California. February 25, 1946.

- M9** History of residual stresses in welded ships. Part VI, Heated panel welding test. (Final Report No. M-624.) E. D. Howe, A. Boodberg and Morrough P. O'Brien. OEMsr-1217; Project Nos. NRC-74 and NS-305; OSRD No. 6588. University of California. February 25, 1946.

- M10** History of residual stresses in welded ships. Part VII, History of deck stresses during the construction of Victory ships. (Final Report No. M-625.) E. D. Howe, A. Boodberg and Morrough P. O'Brien. OEMsr-1217; Project Nos. NRC-74 and NS-305; OSRD No. 6589. University of California. February 25, 1946.

- M11** History of residual stresses in welded ships. Part VIII, Temperature studies of Liberty, Victory and refrigerated cargo ships. (Final Report No. M-630.) E. D. Howe, A. Boodberg and Morrough P. O'Brien. OEMsr-1217; Project Nos. NRC-74 and NS-305; OSRD No. 6590. University of California. February 25, 1946.

602.11 Evaluation in Ships

- M1** History of residual stresses in welded ships. The use of X-rays for the determination of stresses in ship plates. (Progress Report No. M-484.) Daniel Rosenthal, Ralph Hultgren and others. OEMsr-1217; Project Nos. NRC-74 and NS-305; OSRD No. 5060. University of California. May 15, 1945.

- M2** History of residual stresses in welded ships. Part V, The use of X-rays for stress measurement on board ship. (Final Report No. M-609.) E. D. Howe, Bernard York and Morrough P. O'Brien. OEMsr-1217; Project Nos. NRC-74 and NS-305; OSRD No. 6388. University of California. December 5, 1945.

602.2 Multiaxial Stresses

- M1** Review of literature on behavior of metals under multiaxial stresses. (Part I. Final Report No. M-408.) J. L. Walmsley and J. S. Marsh. OEMsr-307; Survey Project No. SP-19; OSRD No. 4403. National Academy of Sciences. November 20, 1944.

- M2** Behavior of steel under conditions of multiaxial stresses and effect of welding and temperature on this behavior. Pilot tests of small tubular specimens. (Progress Report No. M-405.) Harmer E. Davis, G. E. Troxell and others. OEMsr-1221;

Project Nos. NRC-75 and NS-306. OSRD No. 4553. University of California. January 3, 1945.

- M3** Behavior of steel under conditions of multiaxial stresses and effect of welding and temperature on this behavior. Tests of large tubular specimens, ship-plate series. (Final Report No. M-542.) Harmer E. Davis, G. E. Troxell and others. OEMsr-1221; Project Nos. NRC-75 and NS-306; OSRD No. 6365. University of California. December 6, 1945.

602.21 Effect on Metallographic Structure and Chemical Composition

- M1** Behavior of steel under conditions of multiaxial stress and effect on this behavior of metallographic structure and chemical composition. (Progress Report No. M-444.) LeVan Griffis and G. H. Morikawa. OEMsr-1247; Project Nos. NRC-77 and NS-307; OSRD No. 4793. Illinois Institute of Technology. February 22, 1945.

- M2** Behavior of steel under conditions of multiaxial stress and the effect on this behavior of metallographic structure and chemical composition. (Progress Report No. M-490.) LeVan Griffis and G. K. Morikawa. OEMsr-1247; Project Nos. NRC-77 and NS-307; OSRD No. 5346. Illinois Institute of Technology. July 17, 1945.

- M3** Behavior of steel under conditions of multiaxial stress and the effect on this behavior of metallographic structure and chemical composition. Tests of small tubular specimens. (Final Report No. M-644.) Albert Hess, Carl Goodkind and LeVan Griffis. OEMsr-1247; Project Nos. NRC-77 and NS-307; OSRD No. 6593. Illinois Institute of Technology. February 14, 1946.

602.3 Cleavage Fracture

- M1** Cleavage fracture of ship plate as influenced by design and metallurgical factors. Hatch corner specimen tests. (Progress Report No. M-512.) E. Paul De Garmo, J. L. Meriam and others. OEMsr-1418; Project Nos. NRC-92 and NS-336; OSRD No. 5352. University of California. July 21, 1945.

- M2** Correlation of laboratory tests with full-scale ship plate fracture tests. (Final Report No. M-526.) Maxwell Gensamer, W. T. Lankford, Jr. and others. OEMsr-1426; Project Nos. NRC-96 and NS-336; OSRD No. 5380. Carnegie Institute of Technology. July 26, 1945.

- M3** Correlation of laboratory tests with full-scale ship plate fracture tests. (Final Report No. M-613.) Maxwell Gensamer, T. A. Prater and others. OEMsr-1418; Project Nos. NRC-96 and NS-336; OSRD No. 6204. Pennsylvania State College. October 24, 1945.

- M4** Cleavage fracture of ship plate as influenced by design and metallurgical factors. Part I, Hatch corner specimen tests. (Final Report No. M-607.)

E. Paul De Garmo, J. L. Meriam and others. OEMsr-1418; Project Nos. NRC-92 and NS-336; OSRD No. 6387. University of California. December 4, 1945.

- M5** Cleavage fracture of ship plate as influenced by design and metallurgical factors. Part II, Flat plate tests. (Final Report No. M-608.) Harmer E. Davis, G. E. Troxell and others. OEMsr-1418; Project Nos. NRC-92 and NS-336; OSRD No. 6452. University of California. January 10, 1946.
- M6** Cleavage fracture of ship plate as influenced by size effects. (Final Report No. M-614.) W. M. Wilson, R. A. Hechtman and W. H. Bruckner. OEMsr-1421; Project Nos. NRC-93 and NS-336; OSRD No. 6457. University of Illinois. January 15, 1946.

602.4 Fatigue of Ship Welds

- M1** Fatigue tests of ship welds. (Final Report No. M-606.) S. C. Hollister and J. Garcia. OEMsr-1382; Project Nos. NRC-89 and NS-304; OSRD No. 6544. Cornell University. January 17, 1946.
- M2** Stress analysis of welded sections. (Advisory Report No. M-629.) E. S. Jenkins. OEMsr-307; Survey Project No. SP-25; OSRD No. 6591. National Academy of Sciences. February 22, 1946.

602.5 Hull Construction

602.51 Metallurgical Quality of Steels for Hulls

- M1** Investigation of metallurgical quality of steels used for hull construction. (Progress Report No. M-497.) H. M. Banta, Fred Dunkerley and C. E. Sims. OEMsr-1331; Project Nos. NRC-87 and NS-255; OSRD No. 5062. Battelle Memorial Institute. May 14, 1945.
- M2** Investigation of metallurgical quality of steels used for hull construction. (Progress Report No. M-569.) H. M. Banta, Fred Dunkerley and others. OEMsr-1331; Project Nos. NRC-87 and NS-225; OSRD No. 5492. Battelle Memorial Institute. August 24, 1945.
- M3** Investigation of metallurgical quality of steels used for hull construction. (Progress Report No. M-587.) H. M. Banta, Fred Dunkerley and others. OEMsr-1331; Project Nos. NRC-87 and NS-255; OSRD No. 6073. Battelle Memorial Institute. October 14, 1945.
- M4** Investigation of metallurgical quality of steels used for hull construction. (Final Report No. M-610.) H. M. Banta, Fred Dunkerley and C. E. Sims. OEMsr-1331; Project Nos. NRC-87 and NS-255; OSRD No. 6075. Battelle Memorial Institute. October 14, 1945.

602.52 Weldability and Ductility of Steel

- M1** Weldability of steel for hull construction. Methods of testing weldability of steel plates and shapes. (Progress Report No. M-414.) R. D. Stout, S. S. Tör and others. OEMsr-1323; Project Nos. NRC-

86 and NS-255; OSRD No. 4544. Lehigh University. December 27, 1944.

- M2** Investigation of factors reducing the effective ductility of welded steel members. (Final Report No. M-432.) A. V. DeForest and P. R. Shepler. OEMsr-1192; Research Project No. NRC-72; OSRD No. 4674. Massachusetts Institute of Technology. February 6, 1945.
- M3** Weldability of steel for hull construction. (Final Report No. M-612.) Gilbert E. Doan. OEMsr-1323; Project Nos. NRC-86 and NS-255; OSRD No. 6263. Lehigh University. October 30, 1945.

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FOUNDRY MATERIALS AND PROCESSES

701

Malleable Castings

- M1** Study of the properties of malleable castings for use in tanks, combat vehicles and other military applications. (Progress Report No. M-47.) C. H. Lorig, Philip C. Rosenthal and O. W. Simmons. OEMsr-730; Project Nos. NRC-28 and OD-81; OSRD No. 1215. Battelle Memorial Institute. February 16, 1943.
- M2** Study of the properties of malleable castings for use in tanks, combat vehicles and other military applications. (Final Report No. M-95.) C. H. Lorig, Philip C. Rosenthal and O. W. Simmons. OEMsr-730; Project Nos. NRC-28 and OD-81; OSRD No. 1589. Battelle Memorial Institute. July 12, 1943.

702

Centrifugal Castings

- M1** Centrifugal casting of metals. A. E. Schuh. OEMsr-307. National Academy of Sciences. 1942.
- M2** Improvements in and extension of centrifugal casting methods for production of miscellaneous war materiel items. (Progress Report No. M-33.) A. E. Schuh and Alfred Boyles. OEMsr-650; Research Project No. NRC-26; OSRD No. 1147. US Pipe and Foundry Company. January 14, 1943.
- M3** Improvements in and extension of centrifugal casting methods for production of miscellaneous war materiel items. (Progress Report No. M-63.) A. E. Schuh and Alfred Boyles. OEMsr-650; Research Project No. NRC-26; OSRD No. 1360. US Pipe and Foundry Company. April 9, 1943.
- M4** Improvements in and extension of centrifugal casting methods for production of miscellaneous war materiel items. (Progress Report No. M-120.) (n.a.) OEMsr-650; Project Nos. NRC-26 and OD-108; OSRD No. 1756. US pipe and Foundry Company. August 25, 1943.
- M5** The mathematics underlying the centrifugal casting of metals. (Advisory Report No. M-70.) A. F. Macconochie, W. Prager and G. Handelman. OEMsr-307; Project Nos. OD-108 and SP-10; OSRD No. 1809. National Academy of Sciences. September 10, 1943.
- M6** An analysis of heat flow in metal molds for centrifugal casting of gun tubes, airplane cylinders,

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tank bogey wheels and other war materiel. (Final Report No. M-138.) C. H. Lorig, M. C. Udy and H. C. McIntyre. OEMsr-731; Project Nos. NRC-33 and OD-108; OSRD No. 1935. Battelle Memorial Institute. October 12, 1943.

- M7** Bibliography on centrifugal casting of metal. (Final Report No. M-119.) Howard F. Taylor. Project Nos. NRC-34N and OD-108; OSRD No. 1971. US Naval Research Laboratory. October 28, 1943.

- M8** Improvements in and extension of centrifugal casting methods for production of miscellaneous war materiel items. (Final Report No. M-252.) A. E. Schuh and Alfred Boyles. OEMsr-650; Research Project No. NRC-26; OSRD No. 3584. US Pipe and Foundry Company. April 18, 1944.

- M9** Experimental production of pilot static and centrifugal castings for the armed services. Part I, Centrifugally-cast composite grinding rolls. (Final Report No. M-493.) Raymond H. Schaefer, E. M. Kauibach and others. Research Project No. NRC-61A; OSRD No. 5019. American Brake Shoe and Foundry Company. May 2, 1945.

- M10** Experimental production of pilot static and centrifugal castings for the armed services. Part III, The fluidity of cast alloyed steels and irons. (Final Report No. M-572.) W. S. Mott, Raymond H. Schaefer and Earnshaw Cook. Research Project No. NRC-61A; OSRD No. 5634. American Brake Shoe and Foundry Company. September 10, 1945.

703 Precision Casting

- M1** Centrifugal and precision casting of non-ferrous alloys. Methods of precision castings of metals. (Advisory Report No. M-123.) L. L. Wyman and D. Basch. OEMsr-307; Survey Project No. SP-14; OSRD No. 1844. National Academy of Sciences. September 18, 1943.

- M2** Development and extension of precision casting methods for production of miscellaneous war materiel items. (Final Report No. M-242.) W. E. Ruder. OEMsr-1130; Project Nos. NRC-69 and OD-144; OSRD No. 4398. General Electric Company. November 30, 1944.

- M3** Development and extension of precision casting methods for production of miscellaneous war materiel items. (Part II. Final Report No. M-456.) L. L. Wyman. OEMsr-307; Project Nos. NRC-69 and OD-144; OSRD No. 4656. National Academy of Sciences. January 30, 1945.

704 Refractories

704.1 Substitute for Sillimanite

- M1** Development of a substitute for sillimanite as a wet-patch material. (Final Report No. 107.) F. H. Norton. NDCrc-181; Service Project No. OD-35; OSRD No. 169. Massachusetts Institute of Technology. November 6, 1941.

- M2** Development of a substitute for sillimanite in pouring rings used in special steel foundry practice. (Final Report No. M-6.) F. H. Norton. NDCrc-181; Service Project No. OD-35-2; OSRD No. 607. Massachusetts Institute of Technology. May 19, 1942.

704.2 Pouring Box Refractories

- M1** Acceptance test for firebrick. Pouring box refractories. (Report No. 134.) George A. Bole. OEMsr-17; Service Project No. OD-35; OSRD No. 189. Ohio State University. December 8, 1941.

- M2** Acceptance test for firebrick. Pouring box refractories. (Final Report No. M-4.) George A. Bole and Howard J. Orlowski. OEMsr-17; Service Project No. OD-35-1; OSRD No. 517. Ohio State University. March 16, 1942.

800 EXAMINATION OF ENEMY MATERIEL

- M1** Examination of enemy materiel. (Final Report No. M-604.) L. H. Grenell, A. B. Westerman, and H. W. Gillett. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 6171. Battelle Memorial Institute. October 19, 1945.

801 German

801.1 Aircraft Materiel

801.11 Engines

- M1** Examination of enemy materiel. Metallurgical examination of German and Japanese bushings and oil lines. (Progress Report No. M-539.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5200. Battelle Memorial Institute. June 12, 1945.

- M2** Metallurgical examination of air cleaner on German DB-601 engine from ME-109 plane. (Reference No. 663.) L. H. Grenell. OEMsr-722; Research Project No. NRC-32. Battelle Memorial Institute. August 13, 1945.

801.12 Instruments

- M1** Examination of enemy materiel. Metallurgical examination of a German airspeed indicator. (Progress Report No. M-356.) L. R. Jackson, W. W. Beaver and H. W. Gillett. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 4072. Battelle Memorial Institute. August 24, 1944.

- M2** Examination of enemy materiel. Metallurgical examination of a German aircraft master compass and a pilot repeater compass. (Progress Report No. M-360.) L. R. Jackson, W. W. Beaver and H. W. Gillett. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 4090. Battelle Memorial Institute. August 29, 1944.

- M3** Examination of enemy materiel. Metallurgical examination of a German and a Japanese altimeter. (Progress Report No. M-358.) L. R. Jackson,

W. W. Beaver and H. W. Gillett. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 4113. Battelle Memorial Institute. September 7, 1944.

- M4** Examination of enemy material. Metallurgical examination of a German and a Japanese aircraft rate-of-climb indicator. (Progress Report No. M-397.) L. R. Jackson, W. W. Beaver and H. W. Gillett. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 4281. Battelle Memorial Institute. October 17, 1944.
- M5** Examination of enemy materiel. Metallurgical examination of a German aircraft course meter. (Progress Report No. M-399.) L. R. Jackson, W. W. Beaver and H. W. Gillett. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 4315. Battelle Memorial Institute. November 8, 1944.
- M6** Examination of enemy materiel. Metallurgical examination of the instrument panel of a Jumo 211-B direct gasoline injection engine from a Junkers-88 German bomber. (Progress Report No. M-415.) L. R. Jackson, W. W. Beaver and H. W. Gillett. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 4364. Battelle Memorial Institute. November 13, 1944.
- M7** Examination of enemy materiel. Metallurgical examination of German mechanical and electrical aircraft tachometers. (Progress Report No. M-412.) L. R. Jackson, W. W. Beaver and H. W. Gillett. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 4360. Battelle Memorial Institute. November 13, 1944.

801.13 Miscellaneous Aircraft Materiel

- M1** Examination of enemy materiel. Metallurgical examination of captured enemy pressure vessels. (Progress Report No. M-363.) H. L. Anthony. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 4126. Battelle Memorial Institute. September 7, 1944.
- M2** Examination of enemy materiel. Metallurgical examination of six German explosive bomb rack bolts. (Progress Report No. M-401.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 4317. Battelle Memorial Institute. November 8, 1944.
- M3** Examination of enemy materiel. Metallurgical examination of hardware for Japanese and German parachute harnesses. (Progress Report No. M-475.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 4697. Battelle Memorial Institute. February 12, 1945.
- M4** Examination of enemy materiel. Examination of German oxygen valve and German and Japanese oxygen valve seats. (Progress Report No. M-589.) L. H. Grenell, A. B. Westerman and others. OEMsr-722; Project Nos. NRC-32, OD-113 and

others; OSRD No. 5726. Battelle Memorial Institute. September 19, 1945.

801.2 Ordnance Materiel

801.21 Ammunition

- M1** Examination of enemy materiel. Fabrication methods used on a bi-metal driving band on an 80-mm German projectile, and copper conservation through use of bi-metal bands. (Progress Report No. M-48.) H. W. Gillett. OEMsr-722; Research Project No. NRC-32; OSRD No. 1216. Battelle Memorial Institute. February 16, 1943.
- M2** Examination of enemy materiel. A metallurgical examination of a German 50-mm high-explosive round. (Progress Report No. M-88.) H. W. Gillett. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 1492. Battelle Memorial Institute. June 3, 1943.
- M3** Examination of enemy materiel. Chemical and metallurgical examination of three German bomb fragments. (Progress Report No. M-89.) H. W. Gillett, L. H. Grenell and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 1499. Battelle Memorial Institute. June 4, 1943.
- M4** Examination of enemy materiel. A metallurgical examination of a German Gerlich armor-piercing shell. (Progress Report No. M-91.) H. W. Gillett, L. H. Grenell and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 1561. Battelle Memorial Institute. June 4, 1943.
- M5** Examination of enemy material. A metallurgical examination of two German 37-mm high-explosive shells. (Progress Report No. M-100.) H. W. Gillett, L. H. Grenell and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 1565. Battelle Memorial Institute. July 1, 1943.
- M6** Examination of enemy materiel. A metallurgical examination of two German 8.8-cm high-explosive shells. (Progress Report No. M-122.) H. W. Gillett, A. S. Henderson and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 1715. Battelle Memorial Institute. August 14, 1943.
- M7** Examination of enemy materiel. Metallurgical and chemical examination of German 7.9-mm cartridge link belts. (Progress Report No. M-131.) H. W. Gillett, A. S. Henderson and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 1753. Battelle Memorial Institute. August 26, 1943.
- M8** Examination of enemy materiel. A metallurgical examination of a duplex, welded 75-mm German AP-HE-C-BC projectile and a 75-mm German high-explosive projectile manufactured [in] 1942. (Progress Report No. M-135.) H. W. Gillett, A. S. Henderson and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 1782. Battelle Memorial Institute. September 2, 1943.
- M9** Examination of enemy materiel. Metallurgical examination of German Rheinmetall aerial bomb

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- fuzes. (Progress Report No. M-143.) H. W. Gillett, A. S. Henderson and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 1853. Battelle Memorial Institute. September 20, 1943.
- M10** Examination of enemy materiel. A survey of various German ammunition carriers. (Progress Report No. M-144.) H. W. Gillett, A. S. Henderson and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 1865. Battelle Memorial Institute. September 24, 1943.
- M11** Examination of enemy materiel. Metallurgical examination of German 50-mm mortar shells manufactured in 1939 and 1940. (Progress Report No. M-192.) H. W. Gillett, A. S. Henderson and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 3125. Battelle Memorial Institute. January 10, 1944.
- M12** Examination of enemy materiel. Metallurgical examination of German 80-mm mortar shells. (Progress Report No. M-198.) H. W. Gillett, A. S. Henderson and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 3115. Battelle Memorial Institute. January 10, 1944.
- M13** Examination of enemy materiel. Metallurgical examination of tungsten-carbide cores from German armor-piercing projectiles. (Progress Report No. M-226.) C. A. Reichelderfer, J. M. Blalock and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 3268. Battelle Memorial Institute. February 14, 1944.
- M14** Examination of enemy materiel. Metallurgical examination of two German 15-cm anticoncrete shells and carriers. (Progress Report No. M-236.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 3368. Battelle Memorial Institute. March 13, 1944.
- M15** Examination of enemy materiel. Examination of ten rounds of German 20-mm high-explosive ammunition. (Progress Report No. M-241.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 3417. Battelle Memorial Institute. March 21, 1944.
- M16** Examination of enemy materiel. Metallurgical examination of a German 75-mm high-explosive hollow-charge shell. (Progress Report No. M-246.) R. M. Evans, C. A. Reichelderfer and H. W. Gillett. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 3538. Battelle Memorial Institute. April 8, 1944.
- M17** Examination of enemy materiel. Metallurgical examination of German armor-piercing tungsten-carbide rounds of 28/20, 37 and 50-mm calibers. (Progress Report No. M-248.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3536. Battelle Memorial Institute. April 14, 1944.
- M18** Examination of enemy materiel. Metallurgical examination of German 50-mm armor-piercing high-explosive Monobloc shells with long and short cartridge cases. (Progress Report No. M-253.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3586. Battelle Memorial Institute. April 24, 1944.
- M19** Examination of enemy materiel. Metallurgical examination of German and Italian 20-mm armor-piercing ammunition, 1938 to 1943. (Progress Report No. M-261.) J. R. Cady, L. H. Grenell and H. W. Gillett. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3588. Battelle Memorial Institute. April 24, 1944.
- M20** Examination of enemy materiel. Metallurgical examination of German 50-mm high-explosive shells with long and short cartridge cases. (Progress Report No. M-262.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3585. Battelle Memorial Institute. April 24, 1944.
- M21** Examination of enemy materiel. Metallurgical examination of German 50-mm APC-HE rounds with long and short cartridge cases. (Progress Report No. M-281.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3636. Battelle Memorial Institute. May 10, 1944.
- M22** Examination of enemy materiel. Metallurgical examination of four German duplex welded 37-mm armor-piercing rounds and three German 37-mm armor-piercing high-explosive projectiles. (Progress Report No. M-284.) L. H. Grenell, J. G. Dunleavy and H. W. Gillett. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3665. Battelle Memorial Institute. May 15, 1944.
- M23** Examination of enemy materiel. Metallurgical examination of two German 10.5-cm APC-BC rounds. (Progress Report No. M-296.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3716. Battelle Memorial Institute. June 2, 1944.
- M24** Letter to Lt. Col. C. H. Greenall. Subject: Section of German 80-mm mortar shell. H. W. Gillett. [OEMsr-722; Research Project No. NRC-32.] Battelle Memorial Institute. February 22, 1945.
- M25** Examination of enemy materiel. Metallurgical examination of a German 7.62-cm armor-piercing w/tungsten-carbide short case (Russian) shot. (Progress Report No. M-517.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5048. Battelle Memorial Institute. May 11, 1945.
- M26** Examination of enemy materiel. Metallurgical examination of a German 88-mm AP-HE-C-BC Pak 43 shell. (Progress Report No. M-518.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5049. Battelle Memorial Institute. May 11, 1945.
- M27** Examination of enemy materiel. Metallurgical examination of a German 75-mm KwK 42, AP-HE-C and BC projectile and cartridge case. (Prog-

ress Report No. M-535.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5136. Battelle Memorial Institute. May 28, 1945.

801.22 Armor

- M1** Examination of enemy materiel. A metallurgical study of a sample of German surface-hardened armor plate. (Progress Report No. M-58.) H. W. Gillett. OEMsr-722; Research Project No. NRC-32; OSRD No. 1299. Battelle Memorial Institute. March 24, 1943.
- M2** Examination of enemy materiel. Metallurgical examination of welded armor plate, German PzKw III tank. (Progress Report No. M-212.) L. H. Grenell, J. R. Cady and H. W. Gillett. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 3236. Battelle Memorial Institute. February 4, 1944.
- M3** Examination of enemy materiel. Metallurgical examination of German tank armor plate. (Progress Report No. M-532.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5133. Battelle Memorial Institute. May 29, 1945.

801.23 Rifles, Machine Guns, Bores and Tubes

- M1** Examination of enemy materiel. Metallurgical examination of a 98-K Mauser rifle of 1941. (Progress Report No. M-164.) H. W. Gillett, A. S. Henderson and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 2004. Battelle Memorial Institute. November 12, 1943.
- M2** Examination of enemy materiel. Metallurgical examination of a German MG-34 machine gun of 1941. (Progress Report No. M-188.) H. W. Gillett, A. S. Henderson and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 3017. Battelle Memorial Institute. December 13, 1943.
- M3** Examination of enemy materiel. Metallurgical examination of a German PzB antitank rifle manufactured in 1941. (Progress Report No. M-206.) L. H. Grenell, A. S. Henderson and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 3183. Battelle Memorial Institute. January 17, 1944.
- M4** Examination of enemy materiel. A metallurgical study of a 28/20-mm German gun barrel. (Progress Report No. M-219.) L. H. Grenell, J. G. Dunleavy and H. W. Gillett. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 3257. Battelle Memorial Institute. February 8, 1944.
- M5** Examination of enemy materiel. Metallurgical examination of a German Schweizer submachine gun 9-mm Model MP-40. (Progress Report No. M-225.) L. H. Grenell, J. R. Cady and H. W. Gillett. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 3267. Battelle Memorial Institute. February 14, 1944.
- M6** Examination of enemy materiel. Metallurgical

examination of a German 7.92-mm semi-automatic rifle, Gewehr 41 (W). (Progress Report No. M-224.) L. H. Grenell, H. S. Kalish and H. W. Gillett. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 3263. Battelle Memorial Institute. February 14, 1944.

- M7** Examination of enemy materiel. Metallurgical examination of a series of six 7.9-mm MG-17 German aircraft gun barrels, 1937-1942, and four 13 to 20 mm. (Progress Report No. M-250.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3548. Battelle Memorial Institute. April 14, 1944.
- M8** Examination of enemy materiel. Metallurgical examination of German 20-mm MG-151 Mauser aircraft machine gun. (Progress Report No. M-299.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3818. Battelle Memorial Institute. June 20, 1944.
- M9** Examination of enemy materiel. Metallurgical investigation of a German 170-mm gun tube. (Progress Report No. M-346.) E. L. Bartholomew, Jr., M. S. Burton and F. R. Evans. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 4000. Battelle Memorial Institute. August 7, 1944.
- M10** Examination of enemy materiel. Metallurgical investigation of two 50-mm German tank gun tubes, breech rings and breech ring locking collars. (Progress Report No. M-364.) E. L. Bartholomew, Jr., M. S. Burton and F. R. Evans. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 4135. Battelle Memorial Institute. September 12, 1944.
- M11** Examination of enemy materiel. Metallurgical examination of two German MG-151 aircraft machine gun mounts. (Progress Report No. M-383.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 4214. Battelle Memorial Institute. October 7, 1944.
- M12** Examination of enemy materiel. Metallurgical investigation of German 105-mm gun tube. (Progress Report No. M-390.) E. L. Bartholomew, Jr., M. S. Burton and F. R. Evans. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 4251. Battelle Memorial Institute. October 7, 1944.
- M13** Examination of enemy materiel. Metallurgical examination of a German MG-42, 7.92-mm machine gun. (Progress Report No. M-403.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 4358. Battelle Memorial Institute. November 13, 1944.
- M14** Examination of enemy materiel. Metallurgical investigation of German 170-mm gun. (Progress Report No. M-433.) E. L. Bartholomew, Jr., M. S.

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- Burton and F. R. Evans. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 4463. Battelle Memorial Institute. December 12, 1944.
- M15** Examination of enemy materiel. Metallurgical investigation of German 150-mm gun tube. (Progress Report No. M-438.) E. L. Bartholomew, Jr., M. S. Burton and F. R. Evans. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 4464. Battelle Memorial Institute. December 12, 1944.
- M16** Examination of enemy materiel. Metallurgical examination of a German 7.92-mm MG-17 aircraft machine gun. (Progress Report No. M-443.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 4507. Battelle Memorial Institute. December 19, 1944.
- M17** Examination of enemy materiel. Metallurgical investigation of German 50-mm gun tubes. (Progress Report No. M-473.) E. L. Bartholomew, Jr., M. S. Burton and F. R. Evans. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 4695. Battelle Memorial Institute. February 12, 1945.
- M18** Examination of enemy materiel. Metallurgical investigation of German 75-mm gun tubes. (Progress Report No. M-498.) E. L. Bartholomew, Jr., M. S. Burton and F. R. Evans. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 4913. Battelle Memorial Institute. April 4, 1945.
- M19** Examination of enemy materiel. Metallurgical examination of German MP-43/1, 7.92-mm machine pistol. (Progress Report No. M-502.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 4915. Battelle Memorial Institute. April 6, 1945.
- M20** Examination of enemy materiel. Metallurgical investigation of German 88-mm guns. (Progress Report No. M-525.) E. L. Bartholomew, Jr., M. S. Burton and F. R. Evans. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5110. Battelle Memorial Institute. May 22, 1945.
- M21** Examination of enemy materiel. Metallurgical examination of small arms barrels. (Progress Report No. M-545.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5229. Battelle Memorial Institute. June 19, 1945.
- M22** Examination of enemy materiel. Metallurgical examination of German 75-mm Pak-40 antitank gun carriage. (Progress Report No. M-592.) L. H. Grenell, A. B. Westerman and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5678. Battelle Memorial Institute. September 14, 1945.
- M23** Examination of enemy materiel. Metallurgical examination of a German MG-34 antiaircraft tripod. (Progress Report No. M-603.) L. H. Grenell, A. B. Westerman and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5727. Battelle Memorial Institute. September 19, 1945.
- 801.24 Tanks and Tank Parts**
- M1** Examination of enemy materiel. A metallurgical examination of a track link and typical bearings from German tanks. (Progress Report No. M-157.) H. W. Gillett, A. S. Henderson and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 1963. Battelle Memorial Institute. October 18, 1943.
- M2** Examination of enemy materiel. Metallurgical examination of German tank track links and pins. (Progress Report No. M-503.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 4916. Battelle Memorial Institute. April 6, 1945.
- M3** Examination of enemy materiel. Metallurgical examination of a German Panther, Mark V, tank engine. (Progress Report No. M-580.) L. H. Grenell, A. B. Westerman and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 5504. Battelle Memorial Institute. August 27, 1945.
- M4** Examination of enemy materiel. Metallurgical examination of German Panther, Mark V, tank parts. (Progress Report No. M-590.) L. H. Grenell, A. B. Westerman and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 5712. Battelle Memorial Institute. September 19, 1945.
- 801.3 Miscellaneous German Equipment**
- M1** Examination of enemy materiel. Chemical and metallurgical examination of a German caltrop or tire puncture. (Progress Report No. M-99.) H. W. Gillett, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 1564. Battelle Memorial Institute. July 1, 1943.
- M2** Examination of enemy materiel. A chemical and metallurgical examination of a German needle bearing. (Progress Report No. M-108.) H. W. Gillett, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 1635. Battelle Memorial Institute. July 22, 1943.
- M3** Examination of enemy materiel. Metallurgical examination of German and Japanese aluminum ware. (Progress Report No. M-184.) C. M. Craighead and H. W. Gillett. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 3015. Battelle Memorial Institute. December 13, 1943.
- M4** Examination of enemy materiel. Metallurgical examination of two welded aluminum sections from a German mine. (Progress Report No. M-453.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 4549. Battelle Memorial Institute. January 5, 1945.
- M5** Examination of enemy materiel. Metallurgical examination of a German canteen and messkit and Japanese canteens and helmets. (Progress Re-

port No. M-546.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5265. Battelle Memorial Institute. June 22, 1945.

- M6** Examination of enemy materiel. Metallurgical examination of a German Volkswagen engine. (Progress Report No. M-571.) L. H. Grenell, A. B. Westerman and H. W. Gillett. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5456. Battelle Memorial Institute. August 15, 1945.

- M7** Examination of enemy materiel. Metallurgical examination of German crash-flak helmet and Japanese horseshoes and shoe last. (Progress Report No. M-575.) L. H. Grenell, A. B. Westerman and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5479. Battelle Memorial Institute. August 23, 1945.

- M8** Examination of enemy materiel. Metallurgical examination of a German aircraft torpedo and warhead. (Progress Report No. M-600.) L. H. Grenell, A. B. Westerman and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5717. Battelle Memorial Institute. September 19, 1945.

802 Japanese

802.1 Aircraft Materiel

802.11 Airframe

- M1** Examination of enemy materiel. Metallurgical examination of armor plate from Japanese-type IF Oscar, Mark II, SE fighter. (Progress Report No. M-324.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, NRC-32 and others; OSRD No. 3893. Battelle Memorial Institute. July 11, 1944.
- M2** Examination of enemy materiel. Metallurgical and chemical examination of a Japanese landing gear and wheel. (Progress Report No. M-347.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, NRC-32 and others; OSRD No. 4001. Battelle Memorial Institute. August 9, 1944.
- M3** Examination of enemy materiel. Metallurgical examination of landing gear strut, landing wheel and tail wheel strut assembly from Japanese aircraft Betty. (Progress Report No. M-357.) C. A. Reichelderfer, J. M. Blalock and others. OEMsr-722; Project Nos. OD-113, NRC-32 and others; OSRD No. 4073. Battelle Memorial Institute. August 24, 1944.
- M4** Examination of enemy materiel. Metallurgical examination of airframe sections from Zeke, Val, Lily and Dinah Japanese planes. (Progress Report No. M-377.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, NRC-32 and others; OSRD No. 4179. Battelle Memorial Institute. September 25, 1944.

- M5** Examination of enemy materiel. Metallurgical examination of airframe sections from Japanese aircraft Jill. (Progress Report No. M-391.) C. E. Heussner, A. B. Westerman and H. W. Gillett. OEMsr-722; Project Nos. OD-113, NRC-32 and others; OSRD No. 4252. Battelle Memorial Institute. October 7, 1944.

- M6** Examination of enemy materiel. Examination of Japanese aircraft tires and tube. (Progress Report No. M-396.) (n.a.) OEMsr-722; Project Nos. OD-113, NRC-32 and others; OSRD No. 4280. Battelle Memorial Institute. October 17, 1944.

- M7** Examination of enemy materiel. Corrosion resistance of a steel piston and a magnesium casting from a Japanese oleo landing strut. (Progress Report No. M-400.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, NRC-32 and others; OSRD No. 4316. Battelle Memorial Institute. November 8, 1944.

- M8** Examination of enemy materiel. Metallurgical examination of three Japanese aircraft landing hooks. (Progress Report No. M-419.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, NRC-32 and others; OSRD No. 4368. Battelle Memorial Institute. November 25, 1944.

- M9** Examination of enemy materiel. Metallurgical examination of airframe sections from Japanese aircraft. (Progress Report No. M-429.) C. E. Heussner, L. H. Grenell and others. OEMsr-722; Project Nos. OD-113, NRC-32 and others; OSRD No. 4429. Battelle Memorial Institute. December 6, 1944.

- M10** Examination of enemy materiel. Metallurgical examination of oleo landing strut and wheel from Japanese Sally, Mark II. (Progress Report No. M-430.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, NRC-32 and others; OSRD No. 4424. Battelle Memorial Institute. December 6, 1944.

- M11** Examination of enemy materiel. Metallurgical examination of a tail wheel assembly and landing gear hydraulic retracting strut from a Japanese aircraft, Dinah. (Progress Report No. M-441.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, NRC-32 and others; OSRD No. 4465. Battelle Memorial Institute. December 8, 1944.

- M12** Examination of enemy materiel. Metallurgical examination of Japanese aircraft armor plate. (Progress Report No. M-464.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, NRC-32 and others; OSRD No. 4597. Battelle Memorial Institute. January 20, 1945.

- M13** Examination of enemy materiel. Metallurgical examination of armor plate from Japanese aircraft, Betty. (Progress Report No. M-483.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, NRC-32 and others; OSRD No. 4776. Battelle Memorial Institute. March 3, 1945.

- M14** Examination of enemy materiel. Metallurgical

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- examination of armor plate from Japanese aircraft, Lily 2. (Progress Report No. M-501.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, NRC-32 and others; OSRD No. 4914. Battelle Memorial Institute. April 6, 1945.
- M15** Examination of enemy materiel. Metallurgical examination of landing wheel and strut, wing sections and components from Japanese aircraft, Frances. (Progress Report No. M-513.) A. deS. Brasunas, D. O. Leaser and others. OEMsr-722; Project Nos. OD-113; NRC-32 and others; OSRD No. 5020. Battelle Memorial Institute. May 1, 1945.
- M16** Examination of enemy materiel. Metallurgical examination of Japanese aircraft, Irving, airframe. (Progress Report No. M-522.) C. E. Heussner, L. H. Grenell and others. OEMsr-722; Project Nos. OD-113, NRC-32 and others; OSRD No. 5107. Battelle Memorial Institute. May 21, 1945.
- M17** Examination of enemy materiel. Metallurgical examination of armor plate from Japanese aircraft, Frank. (Progress Report No. M-523.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, NRC-32 and others; OSRD No. 5108. Battelle Memorial Institute. May 21, 1945.
- M18** Examination of enemy materiel. Metallurgical examination of tire and tube from Japanese plane, Frances. (Progress Report No. M-554.) (n.a.) OEMsr-722; Project Nos. OD-113, NRC-33 and others; OSRD No. 5331. Battelle Memorial Institute. July 11, 1945.
- M19** Examination of enemy materiel. Metallurgical examination of flap tracks from Judy and Frances, and skin sections from Frank. (Progress Report No. M-560.) C. E. Heussner, D. O. Lesser and H. W. Gillett. OEMsr-722; Project Nos. OD-113, NRC-32 and others; OSRD No. 5374. Battelle Memorial Institute. July 24, 1945.
- M20** Examination of enemy materiel. Metallurgical examination of float strut from Japanese aircraft, Paul. (Progress Report No. M-568.) L. H. Grenell, A. B. Westerman and others. OEMsr-722; Project Nos. OD-113, NRC-32 and others; OSRD No. 5411. Battelle Memorial Institute. August 3, 1945.
- M21** Examination of enemy materiel. Metallurgical examination of wing hinge fittings from Japanese, Frances, aircraft. (Progress Report No. M-582.) L. H. Grenell, A. B. Westerman and H. W. Gillett. OEMsr-722; Project Nos. OD-113, NRC-32 and others; OSRD No. 5517. Battelle Memorial Institute. August 31, 1945.
- 802.12 Engines**
- M1** Examination of enemy materiel. Metallurgical examination of Japanese roller bearing assemblies from aircraft engine, Zeke. (Progress Report No. M-179.) H. W. Gillett, A. S. Henderson and others. OEMsr-722; Project Nos. OD-113 and NRC-32; OSRD No. 2064. Battelle Memorial Institute. November 22, 1943.
- M2** Examination of enemy materiel. A metallurgical examination of a Japanese four-barrel carburetor. (Progress Report No. M-205.) L. H. Grenell, A. S. Henderson and others. OEMsr-722; Project Nos. OD-113 and NRC-32; OSRD No. 3182. Battelle Memorial Institute. January 17, 1944.
- M3** Examination of enemy materiel. Metallurgical examination of a Japanese aircraft exhaust stack and collector ring. (Progress Report No. M-254.) C. E. Levoe, Howard C. Cross and H. W. Gillett. OEMsr-722; Project Nos. OD-113, AC-77 and NRC-32; OSRD No. 3587. Battelle Memorial Institute. April 24, 1944.
- M4** Examination of enemy materiel. Metallurgical examination of three types of Japanese aircraft exhaust valves and two types of intake valves. (Progress Report No. M-308.) C. E. Levoe, Howard C. Cross and H. W. Gillett. OEMsr-722; Project Nos. OD-113, AC-77 and NRC-32; OSRD No. 3838. Battelle Memorial Institute. June 19, 1944.
- M5** Examination of enemy materiel. Metallurgical examination of a Japanese naval aircraft gear oil pump. (Progress Report No. M-307.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, AC-77 and NRC-32; OSRD No. 3836. Battelle Memorial Institute. June 19, 1944.
- M6** Examination of enemy materiel. Metallurgical examination of a Japanese Sakae-12 engine oil tank. (Progress Report No. M-315.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, AC-77 and NRC-32; OSRD No. 3845. Battelle Memorial Institute. July 3, 1944.
- M7** Examination of enemy materiel. Metallurgical examination and performance tests of a Japanese Yokogawa aircraft magneto. (Progress Report No. M-322.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, AC-77 and NRC-32; OSRD No. 3891. Battelle Memorial Institute. July 11, 1944.
- M8** Examination of enemy materiel. Metallurgical examination of a Japanese aircraft oil radiator. (Progress Report No. M-333.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, AC-77 and NRC-32; OSRD No. 3920. Battelle Memorial Institute. July 18, 1944.
- M9** Examination of enemy materiel. Design features and performance characteristics of the Japanese hand and electric inertia starter. (Report No. M-337.) R. M. Nardone. OEMsr-722; Project Nos. OD-113, AC-77 and NRC-32; OSRD No. 3922. Battelle Memorial Institute. July 20, 1944.
- M10** Examination of enemy materiel. Metallurgical examination of selected parts from Japanese Type 100, radial, 1450-hp aircraft engines. (Progress Report No. M-334.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, AC-77

- and NRC-32; OSRD No. 3921. Battelle Memorial Institute. July 21, 1944.
- M11** Examination of enemy materiel. Metallurgical examination of a Japanese Sakae-12 aircraft engine mount. (Progress Report No. M-340.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, AC-77 and NRC-32; OSRD No. 3967. Battelle Memorial Institute. July 27, 1944.
- M12** Examination of enemy materiel. Metallurgical examination of parts from a Japanese Sakae-12 engine. (Progress Report No. M-350.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, AC-77 and NRC-32; OSRD No. 4063. Battelle Memorial Institute. August 22, 1944.
- M13** Examination of enemy materiel. Metallurgical examination of four different types of Japanese aircraft spark plugs. (Progress Report No. M-362.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, AC-77 and NRC-32; OSRD No. 4125. Battelle Memorial Institute. September 7, 1944.
- M14** Examination of enemy materiel. Metallurgical examination of a Japanese Sakae-21 aircraft engine. (Progress Report No. M-384.) L. H. Grenell, J. R. Cady and H. W. Gillett. OEMsr-722; Project Nos. OD-113, AC-77 and NRC-32; OSRD No. 4234. Battelle Memorial Institute. October 7, 1944.
- M15** Examination of enemy materiel. Metallurgical examination of a Japanese Zeke aircraft volt box. (Progress Report No. M-386.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, AC-77 and NRC-32; OSRD No. 4215. Battelle Memorial Institute. October 7, 1944.
- M16** Examination of enemy materiel. Metallurgical examination of oil cooler from Japanese aircraft, Betty. (Progress Report No. M-395.) E. M. Smith, B. D. Gonser and H. W. Gillett. OEMsr-722; Project Nos. OD-113, AC-77 and NRC-32; OSRD No. 4279. Battelle Memorial Institute. October 17, 1944.
- M17** Examination of enemy materiel. Metallurgical examination of parts from an Aichi V-12 Japanese aircraft engine. (Progress Report No. M-411.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, AC-77 and NRC-32; OSRD No. 4359. Battelle Memorial Institute. November 13, 1944.
- M18** Examination of enemy materiel. Metallurgical examination of a Japanese Kinsei-43 aircraft engine. (Progress Report No. M-422.) L. H. Grenell, J. R. Cady and H. W. Gillett. OEMsr-722; Project Nos. OD-113, AC-77 and others; OSRD No. 4420. Battelle Memorial Institute. December 4, 1944.
- M19** Examination of enemy materiel. Metallurgical examination of parts from a Japanese Mamoru-11 aircraft engine. (Progress Report No. M-437.) L. H. Grenell, J. R. Cady and H. W. Gillett. OEMsr-722; Project Nos. OD-113, AC-77 and NRC-32; OSRD No. 4455. Battelle Memorial Institute. December 8, 1944.
- M20** Examination of enemy materiel. Metallurgical examination of two Japanese Kasei engines, Models 11 and 15. (Progress Report No. M-488.) L. H. Grenell, J. R. Cady and H. W. Gillett. OEMsr-722; Project Nos. OD-113, AC-77 and NRC-32; OSRD No. 4826. Battelle Memorial Institute. March 12, 1945.
- M21** Examination of enemy materiel. Metallurgical examination of Japanese Sakae-12 engine, No. 124676. (Progress Report No. M-504.) L. H. Grenell, J. R. Cady and H. W. Gillett. OEMsr-722; Project Nos. OD-113, AC-77 and others; OSRD No. 4982. Battelle Memorial Institute. April 17, 1945.
- M22** Examination of enemy materiel. Metallurgical examination of a Japanese Kinsei-43 aircraft engine. (Progress Report No. M-524.) L. H. Grenell, J. R. Cady and H. W. Gillett. OEMsr-722; Project Nos. OD-113, AC-77 and others; OSRD No. 5109. Battelle Memorial Institute. May 22, 1945.
- M23** Examination of enemy materiel. Metallurgical examination of Japanese Homare-11 aircraft engine, No. 11515. (Progress Report No. M-538.) L. H. Grenell, J. R. Cady and H. W. Gillett. OEMsr-722; Project Nos. OD-113, AC-77 and others; OSRD No. 5199. Battelle Memorial Institute. June 13, 1945.
- M24** Letter to Lt. Comdr. A. J. M. Hamon. Subject: [A sample cylinder head from a Japanese Homare-21 aircraft engine.] L. H. Grenell. [OEMsr-722;] Research Project No. NRC-32. Battelle Memorial Institute. July 17, 1945.
- M25** Examination of enemy materiel. Metallurgical examination of a Japanese Kawasaki Type 2 aircraft engine. (Progress Report No. M-570.) L. H. Grenell, J. R. Cady and H. W. Gillett. OEMsr-722; Project Nos. OD-113, AC-77 and others; OSRD No. 5472. Battelle Memorial Institute. August 15, 1945.
- M26** Examination of enemy materiel. Metallurgical examination of Japanese Kasei-21 aircraft engine, No. 2189. (Progress Report No. M-597.) L. H. Grenell, A. B. Westerman and others. OEMsr-722; Project Nos. OD-113, AC-77 and others; OSRD No. 6008. Battelle Memorial Institute. October 1, 1945.
- 802.13 Instruments**
- M1** Examination of enemy materiel. Metallurgical examination of two Japanese aircraft bank and turn indicators. (Progress Report No. M-367.) L. R. Jackson, W. W. Beaver and H. W. Gillett. OEMsr-722; Project Nos. OD-113, AC-77 and NRC-32; OSRD No. 4127. Battelle Memorial Institute. September 7, 1944.
- M2** Examination of enemy materiel. Luminescence of

enemy aircraft instrument dials. (Progress Report No. M-368.) J. R. DeVore. OEMsr-722; Project Nos. OD-113, AC-77 and NRC-32; OSRD No. 4145. Battelle Memorial Institute. September 7, 1944.

M3 Examination of enemy materiel. Japanese drift-meter, or bombsight. (Progress Report No. M-416.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. OD-113, NRC-32 and others; OSRD No. 4365. Battelle Memorial Institute. November 13, 1944.

M4 Examination of enemy materiel. Metallurgical examination of a German aircraft fuel consumption meter and a blinker-type oxygen flowmeter. (Progress Report No. M-426.) L. R. Jackson, W. W. Beaver and H. W. Gillett. OEMsr-722; Project Nos. OD-113, NRC-32 and others; OSRD No. 4422. Battelle Memorial Institute. December 4, 1944.

M5 Examination of enemy materiel. Metallurgical examination of a gyro compass from a Japanese aircraft, Val, Mark I. (Progress Report No. M-425.) L. R. Jackson, W. W. Beaver and H. W. Gillett. [OEMsr-722;] Project Nos. OD-113, NRC-32 and others; OSRD No. 4421. Battelle Memorial Institute. December 4, 1944.

802.14 Fuels and Fuel Systems

M1 Examination of enemy materiel. Examination of a joint on a Japanese gasoline tank. (Progress Report No. M-208.) G. O. Hoglund, G. S. Mikhailapov and H. W. Gillett. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 3181. Battelle Memorial Institute. January 22, 1944.

M2 Examination of enemy materiel. Analysis of captured Japanese ethyl fluid. (Progress Report No. M-275.) C. B. Gambrill, C. T. Leacock and M. Sue Aydelott. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3703. Battelle Memorial Institute. May 31, 1944.

M3 Examination of enemy materiel. Metallurgical examination of fuel tank from Japanese aircraft Oscar. (Progress Report No. M-344.) C. A. Reichelderfer, J. M. Blalock and H. W. Gillett. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3999. Battelle Memorial Institute. August 7, 1944.

M4 Examination of enemy materiel. Examination of diaphragm and gasket from Japanese aircraft fuel pump. (Progress Report No. M-378.) R. G. Chollar, F. C. Croxton and H. W. Gillett. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 4180. Battelle Memorial Institute. September 26, 1944.

M5 Examination of enemy materiel. Metallurgical examination of two Japanese gasoline tanks from Judy-type aircraft wing. (Progress Report No. M-514.) C. E. Heussner, J. G. Dunleavy and H. W. Gillett. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5021. Battelle Memorial Institute. May 1, 1945.

M6 Examination of enemy materiel. Metallurgical examination of a Japanese droppable fuel tank. (Progress Report No. M-583.) L. H. Grenell, A. B. Westerman and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5518. Battelle Memorial Institute. August 31, 1945.

802.15 Miscellaneous Aircraft Materiel

M1 Examination of enemy materiel. Metallurgical examination of two Japanese oxygen cylinders. (Progress Report No. M-303.) H. L. Anthony. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3812. Battelle Memorial Institute. June 14, 1944.

M2 Examination of enemy materiel. Metallurgical examination of Japanese oxygen and carbon dioxide cylinders. (Progress Report No. M-394.) H. L. Anthony. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 4267. Battelle Memorial Institute. October 17, 1944.

M3 Examination of enemy materiel. Metallurgical examination of Japanese propeller blades. (Progress Report No. M-418.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 4367. Battelle Memorial Institute. November 25, 1944.

M4 Examination of enemy materiel. Metallurgical examination of a Japanese bomb hoist and release. (Progress Report No. M-428.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 4423. Battelle Memorial Institute. December 6, 1944.

802.2 Ordnance Materiel

802.21 Ammunition

M1 Examination of enemy materiel. A metallurgical examination of a Japanese 75-mm high-explosive shell. (Progress Report No. M-90.) H. W. Gillett, L. H. Grenell and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 1500. Battelle Memorial Institute. June 4, 1943.

M2 Examination of enemy materiel. A metallurgical examination of Japanese 37-mm round nose, armor-piercing ammunition. (Progress Report No. M-148.) H. W. Gillett, A. S. Henderson and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 1942. Battelle Memorial Institute. October 12, 1943.

M3 Examination of enemy materiel. A metallurgical examination of three Japanese 75-mm high-explosive shells and carrier. (Progress Report No. M-196.) H. W. Gillett, A. S. Henderson and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 3127. Battelle Memorial Institute. January 10, 1944.

M4 Examination of enemy materiel. Metallurgical examination of sections of 15, 30 and 50-kilogram Japanese antipersonnel bombs. (Progress Report No. M-283.) L. H. Grenell, J. R. Cady and others.

- OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3661. Battelle Memorial Institute. May 15, 1944.
- M5** Examination of enemy materiel. Metallurgical examination of one 120-mm Japanese high-explosive naval projectile and three fuzes. (Progress Report No. M-294.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3745. Battelle Memorial Institute. June 2, 1944.
- M6** Examination of enemy materiel. Metallurgical examination of six rounds of Japanese 20-mm high-explosive ammunition. (Progress Report No. M-295.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3746. Battelle Memorial Institute. June 2, 1944.
- M7** Examination of enemy materiel. Metallurgical examination of a Japanese 1/3-kg antiparked aircraft bomb. (Progress Report No. M-300.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3814. Battelle Memorial Institute. June 14, 1944.
- M8** Examination of enemy materiel. Metallurgical examination of two Japanese 80-mm high-explosive naval projectiles. (Progress Report No. M-301.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3813. Battelle Memorial Institute. June 14, 1944.
- M9** Examination of enemy materiel. Metallurgical examination of Japanese 63-kilogram bombs, fuzes and gaines. (Progress Report No. M-309.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3839. Battelle Memorial Institute. June 19, 1944.
- M10** Examination of enemy materiel. Metallurgical examination of six rounds of Japanese 20-mm armor-piercing ammunition. (Progress Report No. M-310.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3843. Battelle Memorial Institute. June 27, 1944.
- M11** Examination of enemy materiel. Metallurgical examination of Japanese 25-mm Hotchkiss incendiary and high-explosive incendiary tracer rounds. (Progress Report No. M-314.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3844. Battelle Memorial Institute. July 3, 1944.
- M12** Examination of enemy materiel. Metallurgical examination of Japanese 37-mm high-explosive shells. (Progress Report No. M-320.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3896. Battelle Memorial Institute. July 11, 1944.
- M13** Examination of enemy materiel. Metallurgical examination of four Japanese 50-mm grenades and six fuzes. (Progress Report No. M-319.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3895. Battelle Memorial Institute. July 11, 1944.
- M14** Examination of enemy materiel. Metallurgical examination of Japanese 70-mm and 75-mm high-explosive ammunition. (Progress Report No. M-318.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3894. Battelle Memorial Institute. July 11, 1944.
- M15** Examination of enemy materiel. Metallurgical examination of three 40-mm Japanese naval projectiles. (Progress Report No. M-326.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3918. Battelle Memorial Institute. July 18, 1944.
- M16** Examination of enemy materiel. Metallurgical examination of Japanese .30-caliber and .50-caliber disintegrating cartridge link belts. (Progress Report No. M-327.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3919. Battelle Memorial Institute. July 18, 1944.
- M17** Examination of enemy materiel. Metallurgical examination of Japanese 81-mm high-explosive light mortar shell complete with Type 93 fuze. (Progress Report No. M-339.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3966. Battelle Memorial Institute. July 27, 1944.
- M18** Examination of enemy materiel. Metallurgical examination of four Japanese 47-mm armor-piercing, high-explosive shells. (Progress Report No. M-349.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 4062. Battelle Memorial Institute. August 22, 1944.
- M19** Examination of enemy materiel. Metallurgical examination of a Japanese Army 105-mm high-explosive shell of 1938. (Progress Report No. M-355.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 4071. Battelle Memorial Institute. August 24, 1944.
- M20** Examination of enemy materiel. A metallurgical examination of Japanese 75-mm armor-piercing, high-explosive howitzer rounds. (Progress Report No. M-359.) L. H. Grenell, J. R. Cady and H. W. Gillett. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 4089. Battelle Memorial Institute. August 29, 1944.
- M21** Examination of enemy materiel. Metallurgical examination of two Japanese 140-mm naval projectiles. (Progress Report No. M-372.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 4131. Battelle Memorial Institute. September 14, 1944.
- M22** Examination of enemy materiel. Metallurgical examination of Japanese army 47-mm high-explosive projectiles. (Progress Report No. M-417.)

- L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 4366. Battelle Memorial Institute. November 25, 1944.
- M23** Examination of enemy materiel. Metallurgical examination of two Japanese mechanical impact fuzes and containers. (Progress Report No. M-436.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 4454. Battelle Memorial Institute. December 8, 1944.
- M24** Examination of enemy materiel. Metallurgical examination of an high-explosive 15-cm Japanese naval projectile. (Progress Report No. M-448.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 4548. Battelle Memorial Institute. January 5, 1945.
- M25** Examination of enemy materiel. Metallurgical examination of Japanese 75-mm antiaircraft ammunition. (Progress Report No. M-449.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 4563. Battelle Memorial Institute. January 8, 1945.
- M26** Examination of enemy materiel. Metallurgical examination of Japanese 37-mm armor-piercing, high-explosive ammunition. (Progress Report No. M-474.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 4696. Battelle Memorial Institute. February 12, 1945.
- M27** Examination of enemy materiel. Metallurgical examination of Japanese 30-mm high-explosive incendiary and high-explosive tracer ammunition. (Progress Report No. M-506.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 4917. Battelle Memorial Institute. April 6, 1945.
- M28** Examination of enemy materiel. Metallurgical examination of 5-inch Japanese naval projectile. (Progress Report No. M-534.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5135. Battelle Memorial Institute. May 29, 1945.
- M29** Examination of enemy materiel. Metallurgical examination of a Japanese 50-mm mortar grenade smoke shell and fuze. (Progress Report No. M-565.) L. H. Grenell, A. B. Westerman and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5409. Battelle Memorial Institute. August 3, 1945.
- M30** Examination of enemy materiel. Metallurgical examination of a Japanese 40-mm armor-piercing, high-explosive shell. (Progress Report No. M-576.) L. H. Grenell, A. B. Westerman and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5480. Battelle Memorial Institute. August 23, 1945.
- M31** Examination of enemy materiel. Metallurgical examination of armor-piercing and high-explosive ammunition for Japanese 20-mm Browning-type gun. (Progress Report No. M-574.) L. H. Grenell, A. B. Westerman and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5478. Battelle Memorial Institute. August 23, 1945.
- M32** Examination of enemy materiel. Metallurgical examination of a Japanese 57-mm armor-piercing, high-explosive and high-explosive ammunition. (Progress Report No. M-584.) L. H. Grenell, A. B. Westerman and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5519. Battelle Memorial Institute. August 31, 1945.
- M33** Examination of enemy materiel. Metallurgical examination of Japanese 105-mm high-explosive projectile. (Progress Report No. M-594.) L. H. Grenell, A. B. Westerman and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5713. Battelle Memorial Institute. September 19, 1945.
- M34** Examination of enemy materiel. Metallurgical examination of Japanese 47-mm C/R high-explosive U/F shell for Model 1 A/T gun. (Progress Report No. M-595.) L. H. Grenell, A. B. Westerman and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5714. Battelle Memorial Institute. September 19, 1945.
- M35** Examination of enemy materiel. Metallurgical examination of a Japanese C/R 20-mm Hotchkiss high-explosive shell for Model 98 antiaircraft gun. (Progress Report No. M-596.) L. H. Grenell, A. B. Westerman and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5715. Battelle Memorial Institute. September 19, 1945.
- M36** Examination of enemy materiel. Metallurgical examination of Japanese 75-mm antiaircraft high-explosive shell with fuze. (Progress Report No. M-593.) L. H. Grenell, A. B. Westerman and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5725. Battelle Memorial Institute. September 19, 1945.
- 802.22 Armor**
- M1** Examination of enemy materiel. A chemical and metallurgical examination of a section of Japanese body armor. (Progress Report No. M-117.) H. W. Gillett, J. G. Dunleavy and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 1694. Battelle Memorial Institute. August 9, 1943.
- M2** Examination of enemy materiel. Metallurgical study of two samples of Japanese welded homogeneous light armor. (Progress Report No. M-158.) H. W. Gillett, A. S. Henderson and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 1966. Battelle Memorial Institute. October 18, 1943.

802.23 Rifles, Machine Guns, Mortars and Howitzers

- M1** Examination of enemy materiel. Metallurgical and industrial examination of two Japanese 20-mm aircraft-mounted machine guns of 1941. (Progress Report No. M-194.) H. W. Gillett, A. S. Henderson and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 3109. Battelle Memorial Institute. January 11, 1944.
- M2** Examination of enemy materiel. Metallurgical examination of a 6.5-mm Japanese light machine gun. (Progress Report No. M-203.) A. S. Henderson, L. H. Grenell and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 3116. Battelle Memorial Institute. January 11, 1944.
- M3** Examination of enemy materiel. Metallurgical examination of a Japanese rifle 6.5-mm (caliber .25) 38th year, Pattern M-1905. (Progress Report No. M-235.) L. H. Grenell, J. R. Cady and H. W. Gillett. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 3418. Battelle Memorial Institute. March 13, 1944.
- M4** Examination of enemy materiel. Metallurgical examination of Japanese 50-mm grenade discharger. (Progress Report No. M-269.) L. H. Grenell, J. R. Cady and H. W. Gillett. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3623. Battelle Memorial Institute. May 2, 1944.
- M5** Examination of enemy materiel. Metallurgical examination of a Japanese rifle 7.7-mm (caliber .303-inch) Model 99. (Progress Report No. M-268.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3625. Battelle Memorial Institute. May 2, 1944.
- M6** Examination of enemy materiel. Metallurgical examination of a Japanese 7.7-mm Model 92 heavy machine gun of 1938. (Progress Report No. M-282.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3643. Battelle Memorial Institute. May 15, 1944.
- M7** Examination of enemy materiel. Metallurgical examination of two Japanese 7.7-mm aircraft machine guns of 1938 and 1942. (Progress Report No. M-325.) E. W. Ganslein, C. A. Reichelderfer and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3917. Battelle Memorial Institute. July 18, 1944.
- M8** Examination of enemy materiel. A metallurgical examination of a Japanese 20-mm aircraft machine gun. (Progress Report No. M-351.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 4064. Battelle Memorial Institute. August 22, 1944.
- M9** Examination of enemy materiel. Metallurgical examination of a Japanese aircraft 12.7-mm Browning machine gun. (Progress Report No. M-376.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 4178. Battelle Memorial Institute. September 25, 1944.
- M10** Examination of enemy materiel. Metallurgical examination of a Japanese Model 92 machine gun. (Progress Report No. M-489.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 4827. Battelle Memorial Institute. March 12, 1945.
- M11** Examination of enemy materiel. Metallurgical examination of a Japanese Model 89, 7.7-mm machine gun. (Progress Report No. M-508.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5005. Battelle Memorial Institute. April 24, 1945.
- M12** Examination of enemy materiel. Metallurgical examination of a Japanese 57-mm tank gun, Model 97. (Progress Report No. M-521.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5104. Battelle Memorial Institute. May 21, 1945.
- M13** Examination of enemy materiel. Metallurgical examination of two Japanese Oerlikon-type 20-mm aircraft machine guns for 1944. (Progress Report No. M-533.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5134. Battelle Memorial Institute. May 29, 1945.
- M14** Examination of enemy materiel. Metallurgical examination of Japanese 47-mm antitank gun. (Progress Report No. M-543.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5227. Battelle Memorial Institute. June 19, 1945.
- M15** Examination of enemy materiel. Metallurgical examination of a Japanese aircraft 20-mm Browning-type machine gun. (Progress Report No. M-544.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5228. Battelle Memorial Institute. June 19, 1945.
- M16** Examination of enemy materiel. Metallurgical investigation of an 8-cm Japanese antiaircraft gun. (Progress Report No. M-552.) E. L. Bartholomew, Jr., M. S. Burton and F. R. Evans. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5323. Battelle Memorial Institute. July 9, 1945.
- M17** Examination of enemy materiel. Metallurgical investigations of Japanese 37-mm tank gun. (Progress Report No. M-559.) E. L. Bartholomew, Jr., M. S. Burton and F. R. Evans. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5357. Battelle Memorial Institute. July 24, 1945.
- M18** Examination of enemy materiel. Metallurgical examination of a Japanese 20-mm aircraft machine gun. (Progress Report No. M-567.) L. H. Grenell, A. B. Westerman and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD

No. 5410. Battelle Memorial Institute. August 3, 1945.

M19 Examination of enemy materiel. Metallurgical examination of a Japanese 7.92-mm Type 1 flexible A/C machine gun (twin-barreled) and a flexible ammunition chute for Type 2, hand-operated turret 12.7-mm machine gun (Sally and Lily dorsal position). (Progress Report No. M-577.) L. H. Grenell, W. W. Beaver and H. W. Gillett. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5493. Battelle Memorial Institute. August 27, 1945.

M20 Examination of enemy materiel. Metallurgical examination of a Japanese 7.92-mm Type 98 flexible A/C machine gun. (Progress Report No. M-581.) L. H. Grenell, A. B. Westerman and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5516. Battelle Memorial Institute. August 31, 1945.

M21 Examination of enemy materiel. Metallurgical investigation of a Japanese 75-mm regimental gun. (Progress Report No. M-585.) E. L. Bartholomew, Jr., M. S. Burton and F. R. Evans. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5693. Battelle Memorial Institute. September 14, 1945.

M22 Examination of enemy materiel. Metallurgical investigation of Japanese 81-mm mortars. (Progress Report No. M-601.) E. L. Bartholomew, Jr., M. S. Burton and F. R. Evans. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 6009. Battelle Memorial Institute. September 28, 1945.

M23 Examination of enemy materiel. Metallurgical investigation of a Japanese 15-cm howitzer. (Progress Report No. M-602.) E. L. Bartholomew, Jr., M. S. Burton and F. R. Evans. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 6010. Battelle Memorial Institute. September 28, 1945.

802.24 Miscellaneous Ordnance Materiel

M1 Examination of enemy materiel. Corrosion protection of Japanese ordnance. (Progress Report No. M-204.) A. S. Henderson, L. H. Grenell and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 3165. Battelle Memorial Institute. January 17, 1944.

M2 Examination of enemy materiel. Metallurgical examination of a Type 91, Change 3, 18-inch Japanese torpedo. (Progress Report No. M-457.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 4593. Battelle Memorial Institute and Mellon Institute of Industrial Research. January 18, 1945.

M3 Examination of enemy materiel. Metallurgical examination of a Japanese magnetic antitank mine and fuze. (Progress Report No. M-598.) J. G. Dunleavy, H. W. Gillett and W. E. McKibben. OEMsr-722; Project Nos. NRC-32, OD-113 and

others; OSRD No. 5677. Battelle Memorial Institute. September 14, 1945.

M4 Examination of enemy materiel. Metallurgical examination of a Japanese 20-cm rocket. (Progress Report No. M-599.) L. H. Grenell, A. B. Westerman and H. W. Gillett. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5716. Battelle Memorial Institute. September 19, 1945.

802.3 Miscellaneous Japanese Equipment

M1 Abstract of confidential report on nickel in Japan. (Report No. M-13.) H. W. Gillett. OEMsr-307; OSRD No. 760. National Academy of Sciences. August 1, 1942.

M2 Examination of enemy materiel. A metallurgical examination of miscellaneous Japanese articles. (Progress Report No. M-116.) H. W. Gillett, L. H. Grenell and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 1695. Battelle Memorial Institute. August 8, 1943.

M3 Examination of enemy materiel. Metallurgical examination of a Japanese navy 1 KVA alternating current generator repair kit. (Progress Report No. M-323.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3892. Battelle Memorial Institute. July 11, 1944.

M4 Examination of enemy materiel. Metallurgical examination of Japanese electrical cable. (Progress Report No. M-485.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 4777. Battelle Memorial Institute. March 3, 1945.

M5 Examination of enemy materiel. Metallurgical examination of captured Japanese aluminum pressure vessels used for the storage of oxygen. (Progress Report No. M-486.) H. L. Anthony. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 4812. Battelle Memorial Institute. March 5, 1945.

803 Other Countries

803.1 Ordnance Materiel

803.11 Armor

M1 Examination of enemy materiel. Metallurgical examination of Czechoslovakian tank armor plate. (Progress Report No. M-316.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 3846. Battelle Memorial Institute. July 3, 1944.

803.12 Rifles and Guns

M1 Examination of enemy materiel. Part I, British Sten Mark III, 9-mm gun. (Progress Report No. M-39.) H. W. Gillett. OEMsr-722; Research Project No. NRC-32; OSRD No. 1138. Battelle Memorial Institute. January 14, 1943.

- M2** Examination of enemy materiel. Metallurgical examination of an Italian 20-mm antitank Solothurn rifle. (Progress Report No. M-202.) A. S. Henderson, L. H. Grenell and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 3126. Battelle Memorial Institute. January 11, 1944.
- 803.2 Miscellaneous Equipment**
- M1** Examination of enemy materiel. Examination of French razor blade steel. (Progress Report No. M-165.) H. W. Gillett, A. S. Henderson and others. OEMsr-722; Project Nos. NRC-32 and OD-113; OSRD No. 2606. Battelle Memorial Institute. November 12, 1943.
- M2** Examination of enemy materiel. Metallurgical examination of six grades of Swedish carbide tool tips. (Progress Report No. M-410.) S. L. Hoyt, E. B. T. Kindquist and H. W. Gillett. OEMsr-722; Project Nos. NRC-32, OD-113 and AC-77; OSRD No. 4387. Battelle Memorial Institute. November 13, 1944.
- M3** Enemy materiel from the metallurgical point of view. (Report No. 666.) J. R. Cady, H. W. Gillett and L. H. Grenell. OEMsr-722. Battelle Memorial Institute February, 1945.
- M4** Examination of enemy materiel. Metallurgical examination of tungsten-carbide powder and compacts. (Progress Report No. M-547.) L. H. Grenell, J. R. Cady and others. OEMsr-722; Project Nos. NRC-32, OD-113 and others; OSRD No. 5230. Battelle Memorial Institute. June 21, 1945.
- 900 MISCELLANEOUS METALLURGICAL REPORTS**
- M1** Industrial application of chromium plating. (Report No. M-26.) M. Kolodney. OEMsr-307; OSRD No. 1074. National Academy of Sciences. November 27, 1942.
- M2** Rivets and rivet steel. Proposed research project. (Advisory Report No. M-42.) (n.a.) OEMsr-307; OSRD No. 1162. National Academy of Sciences. January 22, 1943.
- M3** Upgrading of lead-bearing copper alloy scrap. (Advisory Report No. M-55.) (n.a.) OEMsr-307; OSRD No. 1244. National Academy of Sciences. March 5, 1943.
- 901 Quartermaster Supplies**
- 901.1 Coatings**
- 901.11 Fused**
- M1** [The] development of a suitable and non-critical fused inorganic coating for cooking utensils and other quartermaster's items. (Final Report No. M-193.) G. H. McIntyre and E. E. Bryant. OEMsr-819; Project Nos. QMC-18 and NRC-46; OSRD No. 3166. Ferro Enamel Corporation. January 13, 1944.
- 901.12 Silver Plating**
- M1** Silver plating of steel flatware. (Advisory Report No. M-51.) Charles L. Faust and Hiram S. Lukens. OEMsr-307; Survey Project No. SP-11; OSRD No. 1240. National Academy of Sciences. March 1, 1943.
- M2** Flatware for army use. (Part I. Final Report No. M-515.) Hiram S. Lukens. OEMsr-307; Project Nos. SP-11 and QMC-21; OSRD No. 5141. National Research Council. May 29, 1945.
- M3** Flatware for army use. (Part II. Final Report No. M-632.) Hiram S. Lukens. OEMsr-307; Survey Project No. SP-11; OSRD No. 6568. National Academy of Sciences. January 23, 1946.
- 901.2 Miscellaneous Quartermaster Items**
- M1** Metallurgical studies and surveys of Army Quartermaster Corps supplies. Part I, Problems under investigation for the Office of the Quartermaster General for the period February 1, 1943 to August 1, 1943. Part II, Camouflage of mess gear. (Final Report No. M-166.) Robert S. Williams. OEMsr-912; Project Nos. QMC-25 and NRC-54; OSRD No. 2065. Massachusetts Institute of Technology. November 16, 1943.
- M2** Development and evaluation of an economical corrosion-resisting alloy for quartermaster items. (Final Report No. M-469.) H. A. Pray and F. W. Fink. OEMsr-1400; Project Nos. QMC-39 and NRC-91; OSRD No. 4673. Battelle Memorial Institute. February 5, 1945.
- 902 Properties of Metals**
- 902.1 Behavior of Metals Under Dynamic Conditions**
- M1** [The] behavior of metals under dynamic conditions. (Final Report No. M-492.) Donald S. Clark. [OEMsr-348;] Project Nos. NRC-82 and NS-109; OSRD No. 4868. California Institute of Technology. March 27, 1945.
- 902.11 Strain Propagation**
- M1** On the propagation of plastic deformation in solids. (Division 2. Progress Report No. A-29.) Theodor von Kármán. Service Project Nos. CE-5 and CE-6. California Institute of Technology. [December 18, 1941.]
- M2** The propagation of plastic strain in tension. (Division 2. Report No. A-99.) Pol E. Duwez, D. S. Wood and Donald S. Clark. OEMsr-348; Service Project Nos. CE-5 and NO-11. California Institute of Technology. [October, 1942.]
- M3** The propagation of plastic waves in tension specimens of finite length. Theory and methods of integration. (Division 2. Progress Report No. A-103.) Theodor von Kármán, H. F. Bohnenblust and D. H. Hyers. OEMsr-348; Project Nos. CE-5, NO-11 and others. California Institute of Technology. [October, 1942.]

- M4** Graphical solutions for problems of strain propagation in tension. (Division 2. Report No. A-131.) H. F. Bohnenblust, Joseph V. Charyk and D. H. Hyers. OEMsr-348; Service Project Nos. CE-5 and NO-11. California Institute of Technology. January 23, 1943.
- M5** Preliminary experiments on the propagation of plastic deformation. (Division 2. Report No. A-244.) Pol E. Duwez. [OEMsr-348;] Project Nos. NO-11, NS-109 and P2-303; OSRD No. 3207. California Institute of Technology. [January, 1944.]
- M6** [The] behavior of metals under dynamic conditions. The propagation of plastic strain in compression. (Progress Report No. M-302.) Pol E. Duwez, Donald S. Clark and H. E. Martens. OEMsr-348; Project Nos. NS-109 and NRC-82; OSRD No. 3886. California Institute of Technology. July 7, 1944.
- M7** [The] behavior of metals under dynamic conditions. A preliminary investigation of the mechanism of penetration from the standpoint of strain propagation. (Progress Report No. M-317.) Pol E. Duwez and Donald S. Clark. OEMsr-348; Project Nos. NS-109 and NRC-82; OSRD No. 3957. California Institute of Technology. July 19, 1944.
- M8** [The] behavior of metals under dynamic conditions. Progression of yielding. (Progress Report No. M-409.) Pol E. Duwez, H. E. Martens and Donald S. Clark. OEMsr-348; Service Project No. NS-109; OSRD No. 4453. California Institute of Technology. December 9, 1944.

902.12 Tensile Properties

- M1** The influence of specimen length on strain propagation in tension. (Division 2. Progress Report No. A-105.) Pol E. Duwez, D. S. Wood and Donald S. Clark. [OEMsr-348;] Project Nos. CE-5, NO-11 and others. California Institute of Technology. [October, 1942.]
- M2** The effect of stopped impact and reflection on the propagation of plastic strain in tension. (Division 2. Progress Report No. A-108.) Pol E. Duwez, D. S. Wood and others. OEMsr-348; Project Nos. CE-5, NO-11 and others. California Institute of Technology. [November, 1942.]
- M3** The influence of impact velocity on the tensile properties of plain carbon steels and of a cast-steel armor plate. (Division 2. Report No. A-154.) Pol E. Duwez, Donald S. Clark and D. S. Wood. [OEMsr-348;] Project Nos. NO-11, NS-109 and P2-303. California Institute of Technology. [February, 1943.]
- M4** Factors influencing the propagation of plastic strain in long tension specimens. (Division 2. Report No. A-159.) Pol E. Duwez, D. S. Wood and Donald S. Clark. OEMsr-348; Project Nos. NO-11, NS-109 and P2-303. California Institute of Technology. [March, 1943.]
- M5** Dynamic tests of the tensile properties of SAE-1020 steels, Armco iron and 17ST aluminum alloy. (Division 2. Report No. A-182.) Pol E. Duwez, D. S. Wood and Donald S. Clark. OEMsr-348; Project Nos. NO-11, P2-303 and others. California Institute of Technology. [May, 1943.]
- M6** The influence of impact velocity on the tensile properties of Class B armor plate, heat-treated alloy steels and stainless steel. (Division 2. Report No. A-195.) Pol E. Duwez, D. S. Wood and Donald S. Clark. OSRD No. 1641. California Institute of Technology. [July, 1943.]
- M7** Discussion of energy measurements in tension impact tests at the California Institute of Technology. (Division 2. Report No. A-217.) Pol E. Duwez, Donald S. Clark and D. S. Wood. [OEMsr-348;] Project Nos. NO-11, NS-109 and P2-303; OSRD No. 1829. California Institute of Technology. [September, 1943.]
- M8** The influence of specimen dimensions and shape on the results of tensile impact tests. (Division 2. Report No. A-237.) D. S. Wood, Pol E. Duwez and Donald S. Clark. OEMsr-348; Project Nos. NO-11, NS-109 and P2-303; OSRD No. 3028. California Institute of Technology. [December, 1943.]
- M9** The influence of velocity on the tensile properties of a carbon steel, two National Emergency steels and a manganese steel. (Division 2. Report No. A-241.) Donald S. Clark, Pol E. Duwez and D. S. Wood. OEMsr-348; Project Nos. NO-11, P2-303 and others; OSRD No. 3180. California Institute of Technology. [January, 1944.]
- M10** The influence of impact velocity on the tensile properties of four magnesium alloys and 24-S aluminum alloy. (Division 2. Report No. A-249.) Donald S. Clark, Pol E. Duwez and D. S. Wood. OEMsr-348; Project Nos. NO-11, P2-303 and others; OSRD No. 3256. California Institute of Technology. [February, 1944.]
- M11** The influence of impact velocity on the tensile properties of three types of ship plate: MS, HTS and STS. (Division 2. Report No. A-261.) Donald S. Clark, Pol E. Duwez and D. S. Wood. OEMsr-348; Project Nos. NO-11, P2-303 and others; OSRD No. 3420. California Institute of Technology. [March, 1944.]
- M12** The behavior of metals under dynamic conditions. Influence of impact velocity on the tensile properties of furniture steel sheets. (Progress Report No. M-264.) Pol E. Duwez, Donald S. Clark and H. E. Martens. OEMsr-348; Project Nos. NO-11, NRC-82 and others; OSRD No. 3696. California Institute of Technology. May 9, 1944.
- M13** [The] behavior of metals under dynamic conditions. Influence of impact velocity on the tensile properties of NE-8715, NE-9415, SAE-1045 and SAE-1090 steels. (Progress Report No. M-257.) Donald S. Clark, Pol E. Duwez and D. S. Wood. OEMsr-348; Project Nos. NO-11, NRC-82 and

others; OSRD No. 3695. California Institute of Technology. May 9, 1944.

- M14** The behavior of metals under dynamic conditions. Influence of impact velocity on the tensile properties of some metals and alloys. (Progress Report No. M-288.) Pol E. Duwez and Donald S. Clark. [OEMsr-348;] Service Project Nos. NO-11, NS-109 and NRC-82; OSRD No. 3837. California Institute of Technology. June 19, 1944.

- M15** [The] behavior of metals under dynamic conditions. The influence of hardness and type of heat treatment on the static and impact tensile properties of an SAE-4340 steel. (Progress Report No. M-462.) Pol E. Duwez, H. E. Martens and others. OEMsr-348; Project Nos. NS-109 and NRC-82; OSRD No. 4775. California Institute of Technology. February 19, 1945.

902.13 Impact Loading

- M1** [The] deflection and perforation of steel plates at impact velocities up to 150 feet per second. (Division 2. Preliminary Report No. A-175.) Pol E. Duwez, D. S. Wood and Donald S. Clark. OEMsr-348; Project Nos. NO-11, NS-109 and P2-303. California Institute of Technology. [April, 1943.]
- M2** The behavior of long beams under impact loading. (Division 2. Report No. A-216.) Pol E. Duwez, Donald S. Clark and others. OEMsr-348; Project Nos. NO-11, NS-109 and P2-303; OSRD No. 1828. California Institute of Technology. [September, 1943.]
- M3** On the static and dynamic plastic bending of plates. (Division 2. Report No. A-228.) D. H. Hyers. OEMsr-348; Project Nos. NO-11, NS-109 and P2-303; OSRD No. 2018. California Institute of Technology. [November, 1943.]
- M4** The behavior of large plates under impact loading. (Division 2. Report No. A-254.) Pol E. Duwez, Donald S. Clark and others. OEMsr-348; Project Nos. NO-11, NS-109 and P2-303; OSRD No. 3292. California Institute of Technology. [February, 1944.]
- M5** [The] behavior of metals under dynamic conditions. Some static and dynamic properties of Zamac II die-cast alloy in relation to its use in Mark 140 (HIR-3) fuze. (Progress Report No. M-234.) Donald S. Clark, Pol E. Duwez and D. S. Wood. OEMsr-348; Project Nos. NO-11, NS-109 and NRC-82; OSRD No. 3425. California Institute of Technology. March 27, 1944.
- M6** [The] behavior of metals under dynamic conditions. The behavior of clamped beams under impact loading. (Progress Report No. M-338.) Pol E. Duwez, H. E. Martens and Donald S. Clark. OEMsr-348; Project Nos. NS-109 and NRC-82; OSRD No. 4043. California Institute of Technology. August 16, 1944.

902.14 Rapid Loading

- M1** [The] behavior of metals under dynamic condi-

tions. Preliminary study of the influence of rapid loading and time at load on the initiation of plastic deformation in tension. (Progress Report No. M-450.) Pol E. Duwez, H. E. Martens and Donald S. Clark. OEMsr-348; Project Nos. NS-109 and NRC-82; OSRD No. 4621. California Institute of Technology. January 22, 1945.

- M2** [The] behavior of metals under dynamic conditions. The design of a hydropneumatic machine for rapid load tensile testing. (Progress Report No. M-461.) D. A. Elmer, Donald S. Clark and D. H. Hyers. OEMsr-348; Project Nos. NS-109 and NRC-82; OSRD No. 4774. California Institute of Technology. February 19, 1945.

902.15 Strain Rate

- M1** [The] behavior of metals under dynamic conditions. Application of pure strain rate tests to an investigation of two 76-mm gun tubes. (Progress Report No. M-460.) Pol E. Duwez, H. E. Martens and others. OEMsr-348; Project Nos. NS-109 and NRC-82; OSRD No. 4729. California Institute of Technology. February 19, 1945.
- M2** [The] behavior of metals under dynamic conditions. The influence of pure strain rate on the tensile properties of three types of ship plate. (Progress Report No. M-459.) Pol E. Duwez, H. E. Martens and others. OEMsr-348; Project Nos. NS-109 and NRC-82; OSRD No. 4773. California Institute of Technology. February 19, 1945.

902.2 Impurities Influencing the Ferromagnetism of Non-Ferrous Alloys

- M1** Investigation of the effects of impurities on the ferromagnetism of non-ferrous alloys. (Progress Report No. M-279.) Allison Butts and John H. Frye, Jr. OEMsr-1249; Project Nos. OD-156 and NRC-79; OSRD No. 3694. Lehigh University. May 20, 1944.
- M2** Investigation of the effects of impurities on the ferromagnetism of non-ferrous alloys. (Progress Report No. M-335.) Allison Butts, John H. Frye, Jr. and P. L. Reiber, Jr. OEMsr-1249; Project Nos. OD-156 and NRC-79; OSRD No. 4056. Lehigh University. August 24, 1944.
- M3** Investigation of the effects of impurities on the ferromagnetism of non-ferrous alloys. (Progress Report No. M-407.) Allison Butts and P. L. Reiber, Jr. OEMsr-1249; Project Nos. OD-156 and NRC-79; OSRD No. 4442. Lehigh University. December 4, 1944.
- M4** Investigation of the effects of impurities on the ferromagnetism of non-ferrous alloys. (Progress Report No. M-479.) Allison Butts and P. L. Reiber, Jr. OEMsr-1249; Project Nos. OD-156 and NRC-79; OSRD No. 4833. Lehigh University. March 20, 1945.
- M5** Investigation of the effects of impurities on the ferromagnetism of non-ferrous alloys. (Final Re-

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port No. M-548.) Allison Butts and P. L. Rieber, Jr. OEMsr-1249; Project Nos. OD-156 and NRC-79; OSRD No. 5471. Lehigh University. August 20, 1945.

902.3 Low-Temperature Properties of Metals

- M1** Literature survey on the low-temperature properties of metals. (Volumes 1 to 7. Report No. 122.) A. E. White and C. A. Siebert. NDCrc-160; Service Project No. OD-34. University of Michigan. December 9, 1941.

902.4 Rare Metal Electrical Contacts

- M1** Osmium. (Advisory Report No. M-134.) E. M. Wise. OEMsr-307; Survey Project No. SP-16; OSRD No. 1750. National Academy of Sciences. August 27, 1943.
- M2** Possibility of interchangeable use of the materials and alloys of the platinum group, silver, tungsten and others, in electrical contacts. (Advisory Report No. M-499.) E. M. Wise. OEMsr-307; Survey Project No. SP-16; OSRD No. 5163. National Academy of Sciences. May 30, 1945.

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- 231.11 Ground Sites**
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- M5** Investigations of 120-mc/s and 50-cms propagation across the English Channel. (n.a.) OSRD Liaison Office No. WA-3157-6. [Great Britain]. (n.d.)

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- M1** Radar echoes from atmospheric phenomena. (Division 14. Report No. 42-2.) Arthur E. Bent. MIT, Radiation Laboratory. March 13, 1943.
- M2** Summer storm echoes on radar MEW. (Report No. 18.) J. S. Marshall, R. C. Langille and William M. Palmer. Army Operational Research Group [Canada]. November 27, 1944.
- M3** Analysis of storm echoes in height, using microwave height finder. (Report No. 30.) L. G. Eon. Army Operational Research Group [Canada]. June 25, 1945.
- 621.2 Rain**
- M1** Comments on: Radar echoes from water droplets, Paper [No.] AC-7930. (Paper No. AC-7931.) R. G. Ross. OSRD Liaison Office No. WA-4149-10. [Ultra Short Wave Propagation Panel, Great Britain.] [March 16, 1945.]
- M2** Echoes from tropical rain on X-band airborne radar. (Division 14. Report No. 728.) Arthur E. Bent. OEMsr-262. MIT, Radiation Laboratory. June 15, 1945.
- 621.3 Lightning**
- M1** Echoes and atmospherics from lightning flashes on P-band. (Report No. RP-49-2.) J. L. Pawsey. OSRD Liaison Office No. II-5-6144(S). Council for Scientific and Industrial Research, Division of Radiophysics [Australia]. [July 11, 1944.]

- 621.4 Clouds**
M1 An observation of diffuse cloud-like echoes. (Report No. RP-246.) J. L. Pawsey and F. J. Kerr. OSRD Liaison Office No. II-5-7007(S). Council for Scientific and Industrial Research, Division of Radiophysics, Australia. March 6, 1945.
- 621.5 Snow**
M1 S-band radar echoes from snow. (Report No. 26.) R. C. Langille, William M. Palmer and L. G. Tibbles. Army Operational Research Group [Canada]. June 14, 1945.
- 621.6 Ground and Sea Clutter**
M1 An investigation into the nature of sea echoes. (Report No. T-1497.) (n.a.) OSRD Liaison Office No. WA-1142-3. [Telecommunications Research Establishment, Great Britain.] May 12, 1943.
- 621.7 Miscellaneous Sources**
M1 Summary of scattering and spurious echoes. (Report No. TR-437.) T. L. Eckersley. OSRD Liaison Office No. II-5-5275. Great Baddow Research Station [Great Britain]. April, 1942.
- 622 Object Sources**
- 622.1 Periscopes and Schnorkels**
M1 Radar echoes from periscopes. (Division 14. Report No. 42-1.) John E. Freehafer. MIT, Radiation Laboratory. March 1, 1943.
M2 Theory of radar return from the Schnorkel. (Division 14. Report No. 671.) P. M. Marcus. OEMsr-262. MIT, Radiation Laboratory. January 15, 1945.
M3 Sea returns and the detection of Schnorkel. (Report No. T-1787.) G. G. MacFarlane. OSRD Liaison Office No. WA-4196-8. [Telecommunications Research Establishment, Great Britain.] February 13, 1945.
M4 Radar results against Schnorkels. A commentary on TRE Report [No.] 1787: Sea returns and the detection of Schnorkel. (ORS/CC Report No. 338.) (n.a.) OSRD Liaison Office No. WA-4276-5. [Operational Research Section, Great Britain.] March 16, 1945.
- 622.2 Ships**
M1 Performance checks and estimation of vessel size on shore-based 10-cm radar sets. D. Lack. OSRD Liaison Office No. WA-1992-3. Army Operational Research Group [Great Britain]. March 30, 1944.
M2 Trials to determine the variation of the apparent reflecting point of plain 10-cm waves from a destroyer. (Report No. M-627.) J. F. Coales and M. Hopkins. OSRD Liaison Office No. WA-3702-1. Admiralty Signal Establishment [Great Britain]. July, 1944.
M3 Fading of S-band echoes from ships in the optical zone. (Report No. 265.) R. I. B. Cooper. OSRD Liaison Office No. WA-3677-8. [Radar Research and Development Establishment, Great Britain.] December 11, 1944.
- 622.3 Aircraft**
M1 Measurement of the effective echoing areas of various aircraft. (Report No. ORG-P-8-1.) Ross Bateman and George Sinclair. US Army, Office of the Chief Signal Officer and Ohio State University. July 2, 1943.
M2 The characteristics of S-band aircraft echoes with particular reference to radar AA No. 3, Mark II. (Report No. 253.) G. H. Beeching and N. Corcoran. OSRD Liaison Office No. WA-2812-13. [Air Defence Research and Development Establishment, Great Britain.] August 4, 1944.
- 622.4 Shell Bursts**
M1 Radar echoes from shell bursts at 4 metres and 50-cms wave lengths. (Report No. 260.) S. M. Taylor and F. E. W. Bugler. [Radar Research and Development Establishment, Great Britain.] September 10, 1944.
- 622.5 Miscellaneous Shapes**
M1 Echoes produced by perfectly conducting objects of certain simple shapes in free space. (Report No. RP-173.) R. E. B. Makinson. OSRD Liaison Office No. II-5-5691. Council for Scientific and Industrial Research, Division of Radiophysics [Australia]. March 25, 1943.
M2 RDF echoes to be expected from objects of various shapes. (Report No. 26.) (n.a.) OSRD Liaison Office No. WA-6-21. [Great Britain.] (n.d.)
- 623 Miscellaneous Echo Problems**
M1 Anomalous echoes observed with 10-cms CD set. (Report No. 119.) A. E. Kempton. OSRD Liaison Office No. II-5-564. [Air Defence Research and Development Establishment, Great Britain.] October 8, 1941.
M2 Radar wave propagation. (Report No. WP-2.) Lloyd J. Anderson, John B. Smyth and others. BuShips Problem No. X4-49CD. US Navy Radio and Sound Laboratory. November 30, 1942.
M3 The resolution of composite echoes with centimetre wave RDF. (Report No. 4070/C/104.) J. R. Benson, J. H. Ramsay and P. B. Blow. OSRD Liaison Office No. WA-1789-2. [Coast Artillery Experimental Establishment, Great Britain.] February 10, 1943.
M4 Microwave radar reflections. (Division 14. Report No. 43-23.) (n.a.) MIT, Radiation Laboratory. February 20, 1943.
M5 The use of permanent echo amplitudes for monitoring S-band radar equipment. (Report No. RP-177/2.) F. J. Kerr and J. F. McConnell. OSRD Liaison Office No. II-5-5750. Council for Scientific and Industrial Research, Division of Radiophysics [Australia]. December 7, 1943.

- M6** The recognition of radar echoes. (Report No. RD-1/353.) F. E. S. Alexander. OSRD Liaison Office No. II-5-5796(S). Department of Scientific and Industrial Research, New Zealand. March 20, 1944.
- M7** The radar-echoing power of conducting spheres. (Report No. 228.) T. Pearcey and J. M. C. Scott. OSRD Liaison Office No. WA-2334-6. [Air Defence Research and Development Establishment, Great Britain.] May 24, 1944.
- M8** The cancellation of permanent echoes by the use of coherent pulses. (Technical Note No. RAD-253.) H. Grayson. OSRD Liaison Office No. WA-3482-7C. Royal Aircraft Establishment [Great Britain]. November, 1944.
- 630 Signals**
- 631 Propagation**
- M1** Propagation of signals on 45.1, 474 and 2800 mc from [the] Empire State Building . . . to Hauppauge and Riverhead, . . . N. Y. (Division 14. [Parts I] and II. Report Nos. 179 and 298.) G. S. Wickizer and A. M. Braaten. OEMsr-691; Research Project No. 423. Radio Corporation of America. July 20, 1943 and July 31, 1944.
- 632 Stability**
- M1** Observations on signal stability at S- and X-frequencies. (Division 14. Report No. 537.) Otto J. Baltzer, Jr., William M. Fairbank and J. D. Fairbank. OEMsr-262. MIT, Radiation Laboratory. March 14, 1944.
- M2** The fluctuations of radar signals. (Division 14. Report No. 569.) H. Goldstein and Paul D. Bales. OEMsr-262. MIT, Radiation Laboratory. May 16, 1944.
- 633 Camouflage**
- M1** Radar camouflage. (Division 14. Report No. 766.) M. M. Andrew, Otto J. Baltzer, Jr. and others. OEMsr-262; Service Project No. NS-296. MIT, Radiation Laboratory. July 16, 1945.
- 700 RADIO COMMUNICATION**
- 710 Areas Investigated**
- 711 Jungle**
- M1** Radio communication in jungles. (Report No. ORG-2-1.) Arthur C. Omberg. US Army, Office of the Chief Signal Officer. September 1, 1943.
- M2** Measurement of factors affecting jungle radio communication. (Report No. ORB-2-3.) Jack W. Herbstreit and William Q. Crichlow. US Army, Office of the Chief Signal Officer. [November 10, 1943.]
- M3** Methods for improving the effectiveness of jungle radio communication. (Technical Bulletin No. Sig. 4.) (n.a.) US War Department. January 14, 1944.
- 712 Sea Paths**
- M1** Trials with a 250-watt frequency-modulated very high frequency sender across a sea water path beyond the optical range. (Report No. 878.) (n.a.) OSRD Liaison Office No. WA-1352-5. Signals Research and Development Establishment [Great Britain]. [September, 1943.]
- 713 Southwest Pacific**
- M1** Summary of radio propagation problems in Southwest Pacific Area. (Report No. ACO/CM-175.) W. C. Babcock. US Army, Southwest Pacific Area. September 6, 1944.
- M2** Measurement of factors affecting radio communication and loran navigation in Southwest Pacific Area. (Report No. ORB-2-4.) Ross Bateman, Jack W. Herbstreit and Robert B. Zechiel. US Army, Office of the Chief Signal Officer. December 16, 1944.
- 720 Communication Devices**
- 721 Passive Repeaters**
- M1** The application of passive repeaters to point-to-point communications at very high frequency and ultra high frequency. (Report No. ORB-P-20-1.) Ross Bateman. US Army, Office of the Chief Signal Officer. April 29, 1944.
- 730 Communication Factors**
- 731 Interference and Noise**
- M1** Methods of reducing radar interference to communications. (Report No. ORB-E-27-2.) Arthur C. Omberg, Joseph B. Epperson and William Q. Crichlow. US Army, Office of the Chief Signal Officer. [April 19, 1944.]
- 732 Range**
- M1** Factors determining the range of radio communications in the various theaters of operation. (Report No. ORG-P-14-1.) Jack W. Herbstreit. US Army, Office of the Chief Signal Officer. June 3, 1943.
- M2** Survey of existing information and data on atmospheric noise level over the frequency range 1 to 30 mc/s. (Paper No. RRB/C-90.) H. A. Thomas and R. E. Burgess. OSRD Liaison Office No. WA-3201-2. Department of Scientific and Industrial Research, Radio Research Board [Great Britain]. February 21, 1944.
- 732.1 Short Range**
- M1** An analysis of the effect of frequency on short distance radio communications. (Report No. ORB-

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P-15-1.) Ross Bateman and William Q. Crichlow.
US Army, Office of the Chief Signal Officer.
August 18, 1943.

M2 Use of the 25 to 50-mc/s band for short-range

wireless communication. (Report No. 130.) (n.a.)
OSRD Liaison Office No. WA-1022-3. Army Op-
erational Research Group [Great Britain]. August
27, 1943.

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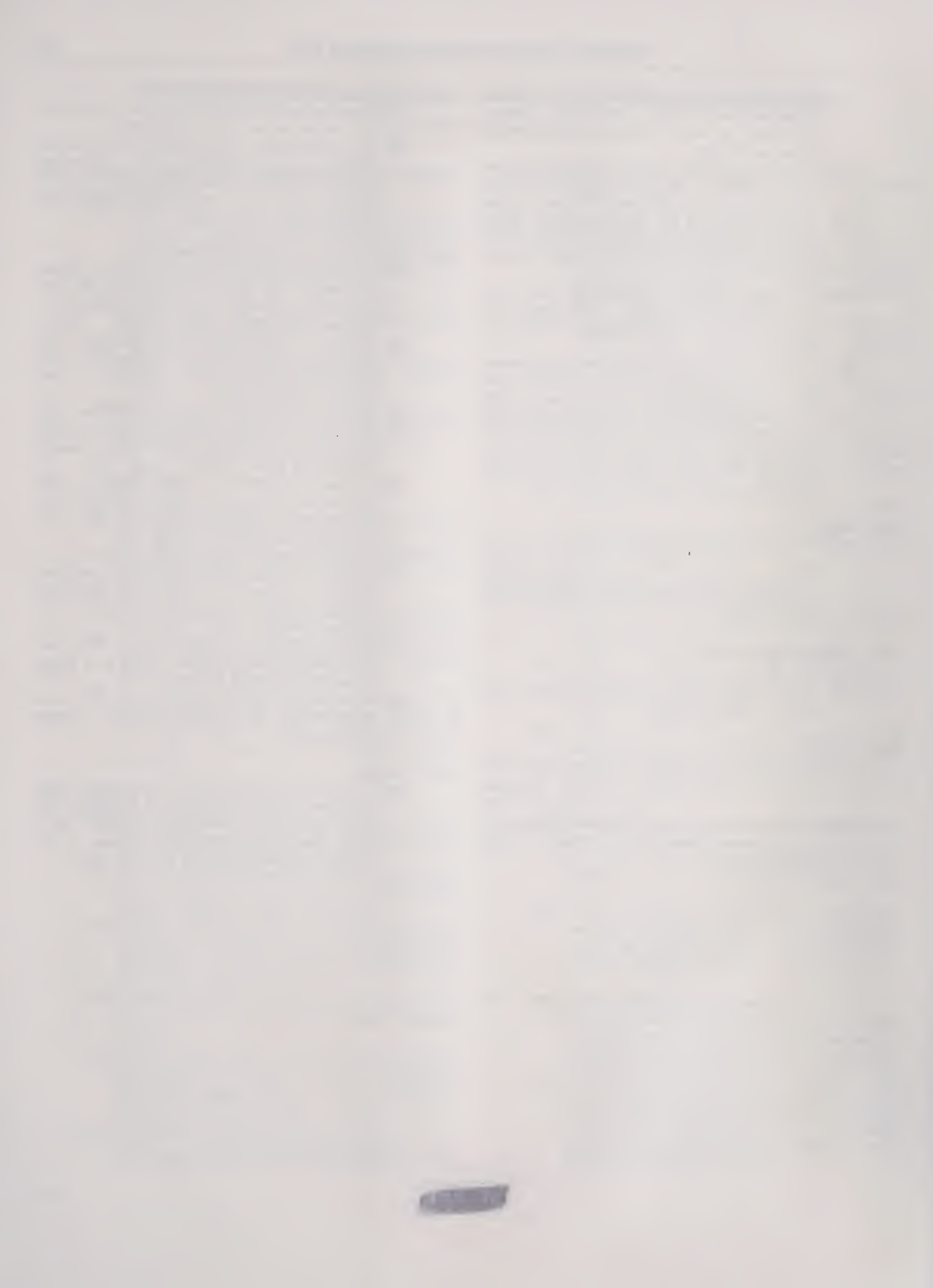
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- 100 FUNGI ASSOCIATED WITH TROPICAL DETERIORATION**
- M1** A preliminary list of micro-organisms which cause damage to Ordnance stores in India, with particular reference to tentage and cordage. (Technical Report No. Bio/45/5.) (n.a.) Controller General of Inspection [Great Britain]. [1945.]
- M2** Handbook of some fungi associated with tropical deterioration. Leland Shanor. OEMsr-1356; OSRD No. 6267. October, 1945.
- M3** Tropical fungus culture collection. William H. Weston. OEMsr-1389; OSRD No. 5681. Harvard University. October 31, 1945.
- M4** Bacteria culture collection. Herbert W. Reuszer. OEMsr-1484; OSRD No. 5682. Alabama Agricultural Experiment Station. October 31, 1945.
- 101 Tests and Studies of Deterioration of Materials**
(See also: 102)
- M1** A house for the study of materials under tropical conditions. (Division 16. Report No. 49.) W. G. Hutchinson and Robert McCrea. OEMsr-205; OSRD No. 4048. University of Pennsylvania. July 25, 1944.
- M2** Report on trip to Panama, October 7 to November 11, 1944. W. G. Hutchinson. [November, 1944.]
- M3** Tropical testing. (Division 16. Report No. 96.) (n.a.) OEMsr-871; OSRD No. 5010. University of Pittsburgh. March 27, 1945.
- M4** The tropical deterioration testing station at Barro Colorado Island. W. G. Hutchinson, Spencer H. Davis, Jr. and J. A. Jump. OEMsr-205; OSRD No. 5690. University of Pennsylvania. October 31, 1945.
- 101.1 Textiles and Cordage**
- M1** The role of bacteria in the deterioration of cotton duck under tropical conditions. Herbert W. Reuszer. OSRD No. 4806. April, 1945.
- M2** Studies of the deterioration of textiles under tropical conditions in the Canal Zone. Elso S. Barghoorn. OSRD No. 4807. April, 1945.
- M3** Conference on biological testing and test organisms. Textile and Cordage Meeting, April 17, 1945. Paul B. Marsh, J. D. Dean and others. Service Project No. AN-14. April 17, 1945.
- M4** Methods of testing biological deterioration of service materials. (n.a.) OSRD No. 6056. October 15, 1945.
- M5** Studies on pure culture methods of testing fungus deterioration of textiles. W. G. Hutchinson. OEMsr-205; OSRD No. 5689. University of Pennsylvania. October 31, 1945.
- M6** Summary of work on tropical deterioration of textiles, January, 1945 to March, 1946 inclusive. William D. Appel. National Bureau of Standards. April 11, 1946.
- 101.2 Plastics, Plasticizers and Synthetic Resins**
- M1** Minutes of the meeting [of the] Subcommittee on Synthetic Resins, Plastics and Plasticizers, Tropical Deterioration Administrative Committee. Alfred E. Brown. June 6, 1945.
- M2** Fungus resistance of plastics. (n.a.) OEMsr-1425; OSRD No. 5683. Bakelite Corporation. September 30, 1945.
- M3** The problem of fungal growth on synthetic resins, plastics and plasticizers. Alfred E. Brown. OSRD No. 6067. October, 1945.
- M4** The effect of moisture and fungus on electrical and mechanical properties of plastic insulating materials. (n.a.) OEMsr-1479; OSRD No. 6324. Johns Hopkins University. October, 1945.
- M5** Development of a method for testing the resistance of plastics to fungus attack. W. G. Hutchinson. OEMsr-205; OSRD No. 5688. University of Pennsylvania. October 31, 1945.
- 101.3 Hookup Wires and Electrical Insulation**
- M1** Effect of moisture and fungus on electrical insulating materials. (n.a.) OEMsr-1479; OSRD No. 5691. Johns Hopkins University. October, 1945.
- M2** Studies on methods of testing hookup wires for resistance to fungus attack. W. G. Hutchinson. OEMsr-205; OSRD No. 5686. University of Pennsylvania. October 31, 1945.
- M3** Fungus growth on hookup wire. R. H. Luce and Warren C. Stoker. OEMsr-1488; OSRD No. 5692. Rensselaer Polytechnic Institute. October 31, 1945.
- 101.4 Coating Materials**
- M1** Insulation measurements on solid dielectrics with particular reference to insulating varnishes. (Report No. 142.) (n.a.) OSRD Liaison Office No. II-5-6635(S). Ministry of Munitions [Australia]. February, 1945.
- M2** Studies on methods of testing coating materials for resistance to fungus attack. W. G. Hutchinson. OEMsr-205; OSRD No. 5687. University of Pennsylvania. October 31, 1945.
- 101.5 Photographic and Optical Equipment**
- M1** Minutes of conference on research conducted in the Canal Zone on the fouling of optical instruments. (Division 16. Report No. 29.) (n.a.) OSRD No. 1833. University of Pennsylvania. July 27, 1943.
- M2** The effect of mites on optical instruments in the tropics. Antifungus and antifilming trials in Ibadan, Nigeria, West Africa. (Report No. 4.) I. G. Campbell. War Office, Directorate of Mechanical Engineering [Great Britain]. [1944(?)]

- M3** The fungus fouling of optical instruments. (Division 16. Report No. 51.) W. G. Hutchinson. OEMsr-205; OSRD No. 4118. University of Pennsylvania. September 30, 1944.
- M4** Tropical deterioration in optical instruments. (Division 16. Report No. 97.) (n.a.) OEMsr-871; OSRD No. 5767. University of Pittsburgh. April 17, 1945.
- M5** Summary report [of the] Subcommittee on Photographic Equipment and Supplies. (n.a.) Service Project No. AN-14.2; OSRD No. 6218. October, 1945.
- M6** The fungus fouling of photographic film. J. A. Jump and W. G. Hutchinson. OEMsr-205; OSRD No. 5685. University of Pennsylvania. October 31, 1945.
- M7** Further studies on the fouling of optical instruments. W. G. Hutchinson. OEMsr-205; OSRD No. 5684. University of Pennsylvania. October 31, 1945.
- M8** Laboratory investigation of mould growth in optical instruments. Antifungus and antifilming trials in Ibadan, Nigeria, West Africa. (Report No. 3.) I. G. Campbell. War Office, Directorate of Mechanical Engineering [Great Britain]. (n.d.)
- 101.6 Metals**
- M1** Conference on tropic proofing. Results of an investigation . . . on the corrosion of metals by thynite liquid and vapour. (n.a.) OSRD Liaison Office No. WA-4369-2D. Ministry of Supply [Great Britain]. April 17, 1945.
- 102 Proofing Against Fungi**
(See also: 101)
- M1** Tropic proofing. (n.a.) Ministry of Supply [Great Britain]. February, 1945.
- 102.1 Textiles**
- M1** Bibliography [of] textiles and cordage. (Report No. 7.) (n.a.) Service Project No. AN-14. December, 1944.
- M2** Fungus proofing of textiles and cordage for use in tropical service. Leland Shanor. OSRD No. 4513. January, 1945.
- 102.2 Plastics and Electronic Equipment**
- M1** Moist tropical exposure of tropicalized phenol plastic terminal strips. (n.a.) April, 1945.
- M2** The combatting of mould growth on service electronic equipment. (Report No. 968.) A. F. Parker-Rhodes. OSRD Liaison Office No. WA-5009-5. Signals Research and Development Establishment [Great Britain]. July, 1945.
- 102.3 Photographic and Optical Equipment**
- M1** The use of merthiosal in aircraft cameras. (Report No. 969.) P. G. Law. OSRD Liaison Office No. II-5-6450(S). Ministry of Munitions, Scientific Instruments and Optical Panel [Australia]. [1944.]
- M2** Cresatin as a treatment for fungus proofing optical instruments. (Division 16. Report No. 44.) (n.a.) OEMsr-205; OSRD No. 3803. University of Pennsylvania. June 25, 1944.
- M3** The tropic proofing of optical instruments. Part I, The value of merthiosal as an internal fungicide. (n.a.) Ministry of Munitions, Scientific Instruments and Optical Panel [Australia]. July, 1944.
- M4** Methods of prevention of fungus fouling of optical instruments in the Canal Zone. (Division 16. Report No. 46.) (n.a.) OEMsr-205; OSRD No. 3952. University of Pennsylvania. July 25, 1944.
- M5** A method for the prevention of mold growth on optical instruments exposed to tropical conditions. (Division 16. Report No. 92.) (n.a.) OEMsr-871; OSRD No. 4371. University of Pittsburgh. December 5, 1944.
- M6** Binoculars fitted with cresatin. (n.a.) OSRD Liaison Office No. WA-4473-4B. Ministry of Supply [Great Britain]. May 26, 1945.
- M7** Prevention of deterioration of optical instruments in the tropics. (n.a.) OSRD No. 6055. October 15, 1945.
- 102.4 Leather**
- M1** The mould proofing of leather equipment for service in the tropics. Antifungus and antifilming trials in Ibadan, Nigeria, West Africa. (Report No. 2.) I. G. Campbell. War Office, Directorate of Mechanical Engineering [Great Britain]. (n.d.)



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- M1** Tables of trigonometric functions to five significant figures, and for every tenth of a mil. (AMP Report No. 24.1.) (n.a.) September, 1943.
- M2** Notes on parameters of probability distributions. (AMP Note No. 13.) (n.a.) June 23, 1944.
- M3** Miscellaneous probability tables. (AMP Note No. 14.) H. H. Germond. July, 1944.
- M4** Scattering and radiation from circular cylinders and spheres. (Division 6. AMP Report No. 62.1R.) Arnold N. Lowan. OEMsr-1046; MIT Research Project DIC-6187. Section No. 6.1-sr1046-2032. Mathematical Tables Project and Massachusetts Institute of Technology. February, 1945.
- M5** Tables for solutions of the wave equation for rectangular and circular boundaries having finite impedance. (Division 6. AMP Note No. 18.) Arnold N. Lowan, Philip M. Morse and others. OEMsr-1046; MIT Research Project DIC-6187; Section No. 6.1-sr1046-2043. Mathematical Tables Project and Massachusetts Institute of Technology. June, 1945.
- M6** Miscellaneous probability and statistical tables and graphs. (AMP Note No. 24.) (n.a.) OEMsr-860. SRG-Princeton. October, 1945.
- M7** Descriptions of mathematical tables computed under the auspices of the Applied Mathematics Panel, NDRC. (AMP Note No. 25.) (n.a.) December, 1945.

12 Mechanical Aids

- M1** A mechanical integrator for first order equations. (AMG Report No. 361.) Hassler Whitney. OEMsr-1007. AMG-Columbia. January 29, 1945.
- M2** Relay computers. (AMP Report No. 171.1R.) George R. Stibitz. February, 1945.
- M3** A talk on relay computers. (AMP Memorandum No. 171.1M.) George R. Stibitz. March, 1945.
- M4** Description of the ENIAC and comments on electronic digital computing machines. (AMP Report No. 171.2R.) J. P. Eckert, Jr., J. W. Mauchly and others. University of Pennsylvania. November 30, 1945.
- M5** Special purpose computing machines. (AMP Memorandum No. 171.2M.) George R. Stibitz. March, 1946.

13 Technics

- M1** An asymptotic series for the integral:

$$\int e^{-B \cot \phi} d\phi.$$
 AMG Report No. 9.) (n.a.) OEMsr-1007. AMG-Columbia. June 15, 1943.

M2 Approximation of the integral:

$$J = \int_{x_r}^{\infty} \frac{e^{-Bx}}{1+x^2} dx \text{ by a continued fraction.}$$

(AMG Report No. 24.) Saunders MacLane and Arthur Sard. OEMsr-1007. AMG-Columbia. July 9, 1943.

- M3** The integration of the ballistic equations on the Aberdeen analyzer. (AMP Report No. 28.1.) W. Feller and Claude E. Shannon. July 15, 1943.
- M4** Letter to Dr. Warren Weaver. Subject: Solution of a wave equation which involves Bessel functions with real arguments greater than 6, and complex arguments. (AMG Report No. 26.) Walter Leighton. OEMsr-1007. AMG-Columbia. July 17, 1943.
- M5** Letter to Dr. Warren Weaver. Subject: Computing the intensity functions for certain values of greater than 6. (AMG Report No. 33.) Walter Leighton. OEMsr-1007. AMG-Columbia. August 5, 1943.
- M6** Letter to Dr. Warren Weaver. Subject: Revised computations. (AMG Report No. 37.) Walter Leighton. OEMsr-1007. AMG-Columbia. August 16, 1943.
- M7** The evaluation of integrals arising in exponential delay averages. (AMP Report No. 50.1.) (n.a.) OEMsr-1007. AMG-Columbia. September, 1943.
- M8** Use of the relay interpolator in certain Applied Mathematics Panel calculations. (AMG Memorandum No. 65.) Saunders MacLane and Arthur Sard. OEMsr-1007. AMG-Columbia. October 11, 1943.
- M9** Memorandum to Walter Lowan. Subject: The intensity function. (AMG Report No. 83.) George Piranian. OEMsr-1007. AMG-Columbia. November 5, 1943.
- M10** Fitting a hyperbolic sine curve to creep data. (AMP Note No. 9.) Max Shiffman and Bernard Friedman. OEMsr-945. AMG-New York University. December, 1943.
- M11** Sundial analysis: mathematical. Report titled: Comments on a memorandum of E. W. Paxson. (AMG Report No. 143.) Daniel C. Lewis and John H. Lewis. OEMsr-1007. AMG-Columbia. March 31, 1944.
- M12** Linear differential equations with arbitrary forcing term. (AMG Report No. 150.) Hassler Whitney. OEMsr-1007. AMG-Columbia. April 19, 1944.
- M13** A solution of the differential equation:

$$\frac{d^2\lambda}{d\tau^2} + \frac{3d\lambda}{d\tau} + 3\lambda = -\frac{d^2\sigma}{d\tau^2} + \frac{3d\sigma}{d\tau}.$$
 (AMG Report No. 170.) (n.a.) OEMsr-1007. AMG-Columbia. May 18, 1944.

- M14** An alternate method for solving the equation: $-au \dot{\Lambda} + \Lambda = \Lambda^0$. (AMG Report No. 179.) Magnus R. Hestenes. [OEMsr-1007.] AMG-Columbia. May 24, 1944.
- M15** Solution of: $\ddot{x} + 2a(t)x + \beta(t)x = f(t)$. (AMG Report No. 216.) Hassler Whitney. [OEMsr-1007.] AMG-Columbia. July 1, 1944.
- M16** Complex roots of polynomial equations. (AMP Note No. 15.) Bernard Friedman. [OEMsr-945.] AMG-New York University. August, 1944.
- M17** The Bode-Stibitz conjecture. (AMG Report No. 294.) [H. C. Fryer.] [OEMsr-1007.] AMG-Columbia. October 26, 1944.
- M18** Remarks on the mechanization of Whitney's equation. (AMG Report No. 337.) [Magnus R. Hestenes.] [OEMsr-1007.] AMG-Columbia. December 18, 1944.
- M19** Note on a particular solution of the differential equation: $-au\lambda + \lambda = u\sigma$. (AMG Report No. 353.) (n.a.) [OEMsr-1007.] AMG-Columbia. January 18, 1945.
- M20** On the solution of certain boundary value problems. (AMP Memorandum No. 131.1M.) (n.a.) Mathematical Tables Project. April, 1945.
- M21** An exposition of Wiener's theory of prediction. (AMP Note No. 20.) (n.a.) [OEMsr-1384.] AMG-Harvard. June, 1945.
- M22** On some partial differential equations which include the heat-sensitivity equation of Gamov and Seeger as a special case. (AMP Memorandum No. 131.2M.) Charles Loewner. [OEMsr-1066.] AMG-Brown University. July, 1945.
- M23** Numerical methods employed by the Mathematical Tables Project. (AMP Note No. 26.) Milton Abramowitz, Gertrude Blanch and others. March, 1946.
- M24** Explanatory note on computing probabilities from Pearson's table of normal bivariate surface. (AMP Note No. 8.) (n.a.) [OEMsr-618.] SRG-Columbia. (n.d.)
- M25** Study Number 40 on a problem presented by the Jam Handy Organization. (AMG Report No. 11.) Daniel C. Lewis. [OEMsr-1007.] AMG-Columbia. (n.d.)

20 STATISTICAL AND PROBABILITY ANALYSES

21 General Methods

(See also: 606.2)

- M1** Use of runs to test the randomness of a sequence of observations. (AMG Report No. 153.) [Churchill Eisenhart.] [OEMsr-1007.] AMG-Columbia. April 22, 1944.
- M2** The statistical sign test. (AMP Memorandum No. 48.1M.) (n.a.) OEMsr-860. SRG-Princeton. February, 1945.
- M3** A warning about statistical efficiency. (AMP Memorandum No. 17.) John W. Tukey. OEMsr-1365. AMG-Princeton. February 28, 1945.

21.1 Sequential Analysis

- M1** Two memoranda on double dichotomies: Statistical analysis of double dichotomies. Number of trials necessary for comparing percentages. (AMP Report Nos. 19.1 and 19.2.) [W. Allen Wallis.] [OEMsr-618.] SRG-Columbia. March 15, 1943.
- M2** Sequential analysis of statistical data. Theory. (AMP Report No. 30.1.) Abraham Wald. [OEMsr-618.] SRG-Columbia. September, 1943.
- M3** Sequential tests of statistical significance. (AMP Memorandum No. 30.1M.) [W. Allen Wallis.] [OEMsr-618.] OSRD No. 3581. SRG-Columbia. April, 1944.
- M4** Sequential analysis of statistical data. Applications. (Revised AMP Report No. 30.2R.) H. A. Freeman and Abraham Wald. [OEMsr-618.] SRG-Columbia. September 15, 1945.

22 Applications

22.1 Sampling Inspection

- M1** Economy in sampling with special reference to engineering experimentation. (Abstract of Ministry of Supply Report No. Q.C./R/7. AMP Memorandum No. 30.2.) G. A. Barnard. [OEMsr-618.] SRG-Columbia. March 24, 1944.
- M2** Sampling inspection. (Revised AMP Memorandum No. 176.1.) (n.a.) [OEMsr-618 and OEMsr-860.] Service Project No. N-120. SRG-Columbia and SRG-Princeton. June, 1945.

22.2 Production Problems

- M1** Statistical analysis for a new procedure in sensitivity experiments. (AMP Report No. 101.1R.) (n.a.) [OEMsr-860.] SRG-Princeton. July, 1944.
- M2** Statistical study of high-temperature alloys. (SRG Report No. 352.) (n.a.) [OEMsr-618.] Service Project No. NS-302. SRG-Columbia. November 1, 1944.
- M3** Statistical study of high-temperature alloys. (SRG Report No. 368.) (n.a.) [OEMsr-618.] Service Project No. NS-302. SRG-Columbia. December 1, 1944.
- M4** Statistical study of high-temperature alloys. (SRG Report No. 389.) (n.a.) [OEMsr-618.] Service Project No. NS-302. SRG-Columbia. January 1, 1945.
- M5** Statistical study of high-temperature alloys. (SRG Report No. 423R.) Milton Friedman. [OEMsr-618.] Service Project No. NS-302. SRG-Columbia. February 1, 1945.
- M6** Statistical study of high-temperature alloys. (SRG Report No. 449.) (n.a.) [OEMsr-618.] Service Project No. NS-302. SRG-Columbia. March 1, 1945.
- M7** Statistical study of high-temperature alloys. (SRG Report No. 471.) (n.a.) [OEMsr-618.] Service Project No. NS-302. SRG-Columbia. April 1, 1945.

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- M8** Statistical analysis of effect of chemical composition on stress-rupture properties of a group of alloys tested at Massachusetts Institute of Technology. (AMP Report No. 122.1R.) (n.a.) OEMsr-618. SRG-Columbia. May, 1945.

100 FLUID DYNAMICS

101 Gas Dynamics

- M1** Remarks on the problem of contact explosions (AMG Report No. 124.) (n.a.) OEMsr-945. AMG-New York University. June, 1945.

101.1 Shock Wave Theory

- M1** Theory of shock waves. (Division 8. Progress Report to August 31, 1942.) John von Neumann. OEMsr-218; Service Project Nos. OD-02 and OD-03; OSRD No. 1140. Institute for Advanced Study. January 29, 1943.
- M2** Repeated reflection of a shock against a rigid wall. (AMP Memorandum No. 38.2.) Harvey Cohn. [OEMsr-945.] AMG-New York University. April, 1943.
- M3** Scheme for the computation of shock waves in gases and fluids. (AMP Memorandum No. 38.7.) Hermann Weyl. [OEMsr-945.] AMG-New York University. July 4, 1943.
- ✓ **M4** Interaction of shock and rarefaction waves in one-dimensional motion. (Division 8. AMP Report No. 38.1.) Richard Courant and Kurt O. Friedrichs. OEMsr-944. Service Project Nos. OD-03 and NO-144; OSRD No. 1567. New York University. July 5, 1943.
- M5** On the pressure inside the Williams gage. (AMP Report No. 36.2.) Herbert J. Greenberg and W. Prager. [OEMsr-1066.] AMG-Brown University. August 2, 1943.
- M6** Remarks on the reflection of conical shocks. (AMP Memorandum No. 38.8.) Kurt O. Friedrichs. OEMsr-945. AMG-New York University. September, 1943.
- M7** On configurations involving three shocks through one point modified by Meyer waves. (AMP Memorandum No. 38.9.) Kurt O. Friedrichs. OEMsr-945. AMG-New York University. September, 1943.
- M8** Shock waves in arbitrary fluids. (AMP Note No. 12.) (n.a.) [OEMsr-945.] AMG-New York University. March, 1944.
- M9** Supersonic flow and shock waves. A manual on the mathematical theory of non-linear wave motion. (AMP Report No. 38.2R.) (n.a.) OEMsr-945. AMG-New York University. August, 1944.
- M10** Letter to Jesse W. M. DuMond. Subject: The problem of the momentum and energy balance in the wave produced by a flying bullet. (AMG Report No. 71.) Kurt O. Friedrichs. [OEMsr-945.] AMG-New York University. October 9, 1944.
- M11** Letter to Dr. Hsue Tsien. Subject: [First results

concerning the problem of an airfoil of minimum drag in supersonic flow.] (AMG Report No. 82.) Kurt O. Friedrichs. [OEMsr-945.] AMG-New University. December 7, 1944.

- M12** [Brief explanation of methods used in cascading problem.] (AMG Report No. 87.) (n.a.) [OEMsr-945.] AMG-New York University. January, 1945.

- M13** On nearly glancing reflection of shocks. (AMP Report No. 108.2R.) Valentine Bargmann. OEMsr-1111. AMG-Institute for Advanced Study. March, 1945.

- M14** Suggestions for measurements in resojets. (AMG Report No. 108.) J. K. Lorne MacDonald. [OEMsr-945.] AMG-New York University. March 21, 1945.

- M15** Comparison of pressure and impulse resulting from detonation processes progressing in different ways. (AMG Report No. 111.) (n.a.) [OEMsr-945.] AMG-New York University. March 27, 1945.

- M16** Letter to Dr. Theodor von Kármán. Subject: Calculations for the airfoil in a flow. (AMG Report No. 114.) Kurt O. Friedrichs. [OEMsr-945.] AMG-New York University. April 13, 1945.

- M17** Remarks on the mathematical theory of detonation and deflagration waves in gases. Supplement to the manual on supersonic flow and shock waves. (AMP Report No. 38.3R.) (n.a.) OEMsr-945. AMG-New York University. July, 1945.

- M18** On the estimations of perturbations due to flow around blast gauges. (AMP Note No. 22.) (n.a.) OEMsr-945; OSRD No. 5639. AMG-New York University. September, 1945.

- M19** Shock conditions and detonation conditions. (AMG Report No. 68.) (n.a.) [OEMsr-945.] AMG-New York University (n.d.)

101.2 Nozzle Designs

- M1** Letter to Lieutenant Commander J. S. Warfel. Subject: A mathematical analysis of nozzle design. (AMG Report No. 39.) Kurt O. Friedrichs. [OEMsr-945.] AMG-New York University. January 12, 1944.

- M2** Remarks about R. P. Fraser's reports on jet research. (AMP Memorandum No. 82.3.) Kurt O. Friedrichs. [OEMsr-945.] AMG-New York University. March, 1944.

- M3** Theoretical studies on the flow through nozzles and related problems. (AMP Report No. 82.1R.) (n.a.) [OEMsr-945.] Service Project No. NA-167. AMG-New York University. April, 1944.

- M4** On supersonic compressors and nozzles. (AMP Report No. 82.2R.) (n.a.) OEMsr-945. AMG-New York University. October, 1944.

- M5** Theoretical remarks on the performance of a supersonic kinetic air compressor. (AMG Report No. 37.) (n.a.) [OEMsr-945.] [AMG-New York University.] (n.d.)

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Hydrodynamics

- M1** An investigation of the hydrodynamics of under-

water projectile forms. (Division 6. Report No. P16/3023, including separate folder of drawings.) Clifford P. Kittredge, Calvin A. Gongwer and John F. Ripkin. OEMsr-20; Section No. C-4sr20-343. Columbia University, New London Laboratory. January 1, 1943.

- M2 The effect of non-spherical shape on the motion of a rising underwater gas bubble. (AMP Memorandum No. 37.5.) Max Shiffman. [OEMsr-945.] AMG-New York University. September, 1943.
- M3 Proposal and analysis of a new numerical method for the treatment of hydrodynamical shock problems. (AMP Report No. 108.1R.) John von Neumann. [OEMsr-1111.] AMG-Institute of Advanced Study. March 20, 1944.
- M4 Bubble periods. (AMG Report No. 88.) (n.a.) [OEMsr-945.] AMG-New York University. January, 1945.

103 Hydropulse Studies

- M1 Note on valveless aero- and hydropulse motors. (AMP Memorandum No. 137.1M.) (n.a.) OEMsr-945; Service Project No. NA-195. AMG-New York University. May, 1945.
- M2 Theoretical studies concerning the hydropulse. Ideal mechanical performance characteristics. (AMP Report No. 137.1R.) (n.a.) OEMsr-945; Service Project No. NA-195. AMG-New York University. July, 1945.

200 WAVE PROPAGATION

201 Underwater Acoustics

- M1 Mathematical theory of the influence of a dome on the directivity pattern of sound beams. (Parts I and II. AMP Memorandum No. 20.1.) Richard Courant, Kurt O. Friedrichs and James J. Stoker. [OEMsr-1007 and OEMsr-945.] AMG-Columbia and AMG-New York University. July 15, 1943.
- M2 Mathematical theory of the influence of a dome on the directivity pattern of sound beams. (Appendix to Part II and Part III. AMP Memorandum No. 20.4.) Eleazer Bromberg, Richard Courant and others. [OEMsr-1007 and OEMsr-945.] AMG-Columbia and AMG-New York University. August 24, 1943.
- M3 Mathematical theory of the influence of a dome on the directivity pattern of sound beams. (Part IV. AMP Memorandum No. 20.7.) Eleazer Bromberg, Richard Courant and others. [OEMsr-1007 and OEMsr-945.] AMG-Columbia and AMG-New York University. September, 1943.
- M4 Preliminary investigation of beam distortion due to close proximity of sound projector to a dome nose. (AMP Memorandum No. 20.8.) J. K. Lorne MacDonald. [OEMsr-945.] AMG-New York University. September, 1943.
- M5 Theory of acoustic scattering and application to grids, rods and shields under water. (AMP Memo-

randum No. 20.6.) (n.a.) [OEMsr-945.] AMG-New York University. September, 1943.

- M6 Radiation patterns from a vibrating plate. (AMP Memorandum No. 20.9.) Eleazer Bromberg and Harvey Cohn. [OEMsr-1007 and OEMsr-945.] AMG-Columbia and AMG-New York University. October, 1943.
- M7 On acoustic reflections and images in domes. (AMP Memorandum No. 20.10.) J. K. Lorne MacDonald. [OEMsr-945.] AMG-New York University. October, 1943.
- M8 Energy transmission and reflection as affected by domes and use of oil inside the dome. (AMG Report No. 94.) (n.a.) [OEMsr-1007.] AMG-Columbia. November 22, 1943.
- M9 On acoustic shielding by circular discs. (AMP Memorandum No. 20.11M.) (n.a.) [OEMsr-945.] AMG-New York University. April, 1944.
- M10 Reduction of interference by modulated pulses. (AMG Report No. 56.) (n.a.) [OEMsr-945.] AMG-New York University. July, 1944.
- M11 A mathematical study of acoustic shielding by some narrow cylinders. (AMP Memorandum No. 115.1M.) J. K. Lorne MacDonald. [OEMsr-945.] AMG-New York University. October, 1944.

202 Scattered Light

- M1 Verification of Mie theory. Calculations and measurements of light scattering by dielectric spherical particles. (Division 10.) Victor K. LaMer. OEMsr-148; Service Project No. CWS-1; OSRD No. 1857. Columbia University. September 29, 1943.
- M2 On light scattering by spheres. (Part I. AMP Report No. 87.1.) Leon Brillouin. [OEMsr-1007.] AMG-Columbia. December, 1943.
- M3 On light scattering by spheres. (Part II. AMP Report No. 87.2.) Leon Brillouin. [OEMsr-1007.] AMG-Columbia. April, 1944.

203 Electromagnetics

- M1 The problem of a plane wave incident on a circular cylinder parallel to the electric vector. (Report No. M-397.) E. B. Moullin and L. G. Reynolds. OSRD Liaison Office No. WA-933-1. Admiralty Signal Establishment [Great Britain]. December, 1941.

203.1 Magnetron

- M1 The theory of the cylindrical magnetron. (AMG Report No. 230.) Leon Brillouin. [OEMsr-1007.] AMG-Columbia. July 19, 1944.
- M2 Electronic theory of the plane magnetron. (AMP Report No. 129.1R.) Leon Brillouin. [OEMsr-1007.] AMG-Columbia. December, 1944.
- M3 Electronic theory of the cylindrical magnetron. Static characteristics. (AMP Report No. 129.2R.) Leon Brillouin. OEMsr-1007. AMG-Columbia. February, 1945.
- M4 Exact electromagnetic equations for plane mag-

netron. (AMP Memorandum No. 129.1M.) Leon Brillouin. OEMsr-1007. AMG-Columbia. May, 1945.

- M5** Oscillations in a plane one-anode magnetron. (AMP Report No. 129.3R.) Leon Brillouin. OEMsr-1007. AMG-Columbia. May, 1945.

203.2 Spherical Coils

- M1** Coil yielding a single-dipole moment. (AMP Report No. 120.1R.) Leon Brillouin. [OEMsr-1007.] AMG-Columbia. July, 1944.
- M2** The mutual inductance between two spherical coils. (Report No. MM-44-110-51.) S. A. Schelkunoff. Bell Telephone Laboratories, Inc. August 25, 1944.
- M3** On spherical coils. (AMP Memorandum No. 120.1M.) Leon Brillouin. [OEMsr-1007.] AMG-Columbia. October, 1944.

204 Wakes and Ship Speeds

- M1** Effect of depth of water on the form of ship waves. (AMG Report No. 146.) James J. Stoker. [OEMsr-1007.] AMG-Columbia. April 3, 1944.
- M2** Attendance at a ship trial off Rockland, Maine. (AMG Report No. 180.) James J. Stoker. [OEMsr-1007.] AMG-Columbia. May 24, 1944.
- M3** Effect of finite depth of water on methods for determining the speed of ships from aerial photographs. (AMG Report No. 212.) (n.a.) [OEMsr-1007.] AMG-Columbia. June 28, 1944.
- M4** Speed of ships from aerial photographs. (AMP Report No. 98.1R.) (n.a.) [OEMsr-1007, OEMsr-618 and OEMsr-945.] AMG-Columbia, SRG-Columbia and AMG-New York University. July, 1944.

300 MECHANICS OF PARTICLES AND RIGID BODIES

301 Metals and Alloys

- M1** On the application of dimensional analysis to the experimental study of the centrifugal casting of metals. (AMP Memorandum No. 13.1.) W. Prager. [OEMsr-1066.] AMG-Brown University. March 12, 1943.

302 Devices

302.1 Spring Hammer Box

- M1** On a problem of colliding oscillators. (AMP Report No. 36.3.) Herbert J. Greenberg, George H. Handelman and others. [OEMsr-1066.] AMG-Brown University. October 6, 1943.
- M2** Forced vibrations of a simple oscillator with limited displacement. (AMP Report No. 36.4.) George H. Handelman, William R. Heller and W. Prager. [OEMsr-1066.] AMG-Brown University. December 17, 1943.
- M3** Stability of periodic dynamical processes subject to discontinuous impulses. (AMP Report No. 36.5R.) Herbert J. Greenberg and Witold Hure-

wicz. [OEMsr-1066.] AMG-Brown University. August 25, 1944.

- M4** On some computations determining stable periodic motions of the spring hammer box. (AMP Memorandum No. 36.1M.) Herbert J. Greenberg and Witold Hurewicz. [OEMsr-1066.] AMG-Brown University. October 17, 1944.

- M5** The amplitude of displacement of the diaphragm of a spring hammer box in certain cases. (AMP Memorandum No. 36.2M.) Herbert J. Greenberg. OEMsr-1066. AMG-Brown University. January 15, 1945.

- M6** An electrical analogue to the spring hammer box. (AMP Report No. 36.6R.) William R. Heller. OEMsr-1066; Service Project No. NS-165. AMG-Brown University. March, 1945.

302.2 Servos

- M1** Servos with torque saturation. (AMP Report No. 73.1R.) Witold Hurewicz. [OEMsr-1066.] AMG-Brown University. May, 1944.

302.3 Equilibrators

- M1** Gun equilibrators. ([Part] I. AMP Report No. 70.1R.) George E. Hay. [OEMsr-1066.] AMG-Brown University. December 12, 1944.
- M2** Gun equilibrators. ([Part] II. AMP Report No. 70.2R.) Herbert J. Greenberg. OEMsr-1066. AMG-Brown University. May, 1945.

302.4 Miscellaneous Devices

- M1** On the determination of the energy of plastic deformation absorbed in a diaphragm. (AMP Report No. 36.1.) George H. Handelman and W. Prager. [OEMsr-1066.] AMG-Brown University. July 12, 1943.

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UNDERWATER BALLISTICS

- M1** Comparison of the performance of 8-inch, 1-inch and 1/2-inch models of the 250-lb. redesigned anti-submarine bomb. (Armament Dept. No. Arm. 140.) (n.a.) Royal Aircraft Establishment, Farnborough [Great Britain]. November, 1942.
- M2** Note on methods of measuring depth of functioning of depth bombs. (SRG Report No. 384.) (n.a.) [OEMsr-618.] SRG-Columbia. December 16, 1944.
- M3** Proceedings of the Second Conference on Underwater Ballistics, held January 29 to 31, 1945, at David Taylor Model Basin and the Naval Ordnance Laboratory. (n.a.) [OEMsr-1384.] AMG-Harvard. [January, 1945.]

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Water Entry

- M1** Dynamic stability of bombs and projectiles. (Division 3. Report No. CIT/JPC-10.) M. A. Biot. OEMsr-418. California Institute of Technology. September 6, 1943.
- M2** On the motion of a projectile after striking water. (AMG Report No. 72.) Garrett Birkhoff, George

- D. Birkhoff and Willard E. Bleick. [OEMsr-1007.] [AMG-Columbia.] [October 4, 1943.]
- M3** On the motion of a projectile after striking water. (AMP Report No. 73.) Garrett Birkhoff, George D. Birkhoff and Willard E. Bleick. [OEMsr-1007.] [AMG-Columbia.] [October 4, 1943.]
- M4** Modeling of water entry of bombs and projectiles. L. B. Slichter. OEMsr-418. California Institute of Technology. March 31, 1944.
- M5** A discussion on the modification of standard bombs to improve skip-bombing technique. (Galcit Memorandum No. 2-1.) Theodor von Kármán, Louis G. Dunn and Joseph V. Charyk. California Institute of Technology. April 7, 1944.
- M6** Underwater projectiles. Prediction of underwater behavior from wind tunnel measurements. (Report No. H/Arm/Res. 23.) R. A. Shaw. OSRD Liaison Office No. WA-3024-14C. Marine Aircraft Experimental Establishment, Helensburgh [Great Britain]. September 26, 1944.
- M7** Added mass of projectiles entering water. (Bomb Firing Tank Note No. 10.) F. P. Mayo and E. G. Richardson. OSRD Liaison Office No. WA-3613-1b. Marine Aircraft Experimental Establishment, Helensburgh [Great Britain]. December 28, 1944.
- M8** Experiments on projectile models and spheres. (AMP Memorandum No. 42.7M.) Norman Levinson. OEMsr-1384. AMG-Harvard. April, 1945.
- M9** Modeling of entry into water. (AMP Memorandum No. 42.10M.) Garrett Birkhoff. OEMsr-1384. AMG-Harvard. May, 1945.
- M10** Water entry. Bibliography. (AMP Memorandum No. 42.8M.) (n.a.) OEMsr-1384. AMG-Harvard. June, 1945.
- 401.1 Ricochet**
- M1** Über den ricochetschuss. Inaugural-dissertation zur erlangung der doktorwürde der hohen philosophischen fakultät der Königl. Christian-Albrechts-Universität zu Kiel. Carl Ramsauer. 1903.
- M2** Ricochet of Mark VII depth charge. (Report No. H/Arm/Res. 7.) R. A. Shaw. OSRD Liaison Office No. WA-4008-1D. Marine Aircraft Experimental Establishment, Helensburgh [Great Britain]. January 13, 1943.
- M3** An elementary consideration of bomb ricochet. (Armament Dept. Note No. Arm. 219.) (n.a.) OSRD Liaison Office No. WA-2526-17B. Royal Aircraft Establishment, Farnborough [Great Britain]. September 2, 1943.
- M4** An analytical consideration of bomb ricochet. (Technical Note No. Arm. 238.) (n.a.) OSRD Liaison Office No. WA-2919-4B. Royal Aircraft Establishment, Farnborough [Great Britain]. November, 1943.
- M5** Ricochet off water. (AMP Memorandum No. 42.4M.) Garrett Birkhoff, George D. Birkhoff and others. [OEMsr-1007.] [AMG-Columbia.] May, 1944.
- M6** Experiments on tailless models of US Army bombs. (AMP Memorandum No. 42.5M.) Norman Levinson. [OEMsr-1384.] AMG-Harvard. September, 1944.
- 401.2 Cavity**
- M1** Scale effect on air cavities formed when spheres enter water. (Armament Dept. Note No. 116.) E. G. Richardson. OSRD Liaison Office No. WA-1475-14. Royal Aircraft Establishment, Farnborough [Great Britain]. September 2, 1942.
- M2** Cavity drag coefficient for flat-nosed bomb. (AMP Memorandum No. 42.1.) T. L. Smith. [OEMsr-1007.] AMG-Columbia. October, 1943.
- M3** Cavity drag on spheres. (AMP Memorandum No. 42.3.) T. L. Smith. [OEMsr-1007.] AMG-Columbia. November, 1943.
- M4** Preliminary remarks on the cavity made by a projectile entering water. (Report No. SRE/UT/4.) B. D. Blackwell. OSRD Liaison Office No. WA-1927-3D. Department of Scientific Research and Experiment [Great Britain]. February, 1944.
- M5** The shape of the cavity behind a sphere in steady motion through water. (Theoretical Research Report No. 21/44.) J. Codd. OSRD Liaison Office No. WA-2526-17f. Armament Research Department, Fort Halstead [Great Britain]. May, 1944.
- M6** Further experiments on air cavities formed when spheres enter liquids. (Armament Department Technical Note No. 289.) E. G. Richardson. OSRD Liaison Office No. WA-2900-6a. Royal Aircraft Establishment, Farnborough [Great Britain]. July, 1944.
- M7** [The cavity formed by the charge entering the water.] Report titled: Diary of visit to Woods Hole, August 14 to 15, 1944. (AMP Report No. 65.) Max Shiffman and Donald C. Spencer. OEMsr-945. AMG-New York University. [August, 1944.]
- M8** On the asymptotic shape of the cavity behind an axially-symmetric nose and a relationship between the asymptotic cavity diameter and the drag coefficient. (AMP Memorandum No. 42.9M.) Norman Levinson. OEMsr-1384. AMG-Harvard. May, 1945.
- M9** Resistance of projectiles followed by a cavity in water. (Report No. UBRC/6.) G. I. Taylor. OSRD Liaison Office No. WA-2526-17c. Underwater Ballistic Research Committee [Great Britain]. (n.d.)
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- M1** The impact of bombs on water and their drag in the cavity stage. (Report No. H/Arm/Res. 9.) R. A. Shaw. OSRD Liaison Office No. WA-2526-17d. Marine Aircraft Experimental Establishment, Helensburgh [Great Britain]. February 17, 1943.
- M2** Drag of inclined cylinder. (AMP Memorandum No. 42.2.) T. L. Smith. [OEMsr-1007.] AMG-Columbia. October, 1943.

- M3** Computation table for drag coefficients. (AMG Memorandum No. 42.7W.) Norman Levinson. [OEMsr-1384.] AMG-Harvard. October, 1944.
- M4** Drag coefficients of spherical and conical bomb nose forms in cavitated motion in water. (Technical Note No. Arm. 301.) R. W. Duncan and F. E. Bradley. OSRD Liaison Office No. WA-3519-2. Royal Aircraft Establishment, Farnborough [Great Britain]. November, 1944.
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- M1** Tables for computing the descending trajectory of a projectile with drag proportional to the square of the velocity. (AMP Report No. 77.1.) (n.a.) Mathematical Tables Project. November, 1943.
- M2** Control of the underwater trajectory of projectiles in cavity flow. (Report No. UBRC/29.) N. Simmons. OSRD Liaison Office No. WA-3746-3a. Underwater Ballistic Research Committee, Fort Halstead [Great Britain]. December, 1944.
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- M5** [Underwater trajectories of bombs.] Report titled: Comments on Project No. 121. (AMG Report No. 76.) Garrett Birkhoff, George D. Birkhoff and others. [OEMsr-1007.] AMG-Columbia. (n.d.)
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- M2** Use of the hydropressure plug for water impact studies. (Report No. CIT/IOC-35.) R. R. Stokes. California Institute of Technology. September 15, 1944.
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- M5** The force of impact on a sphere striking a water surface. Second approximation. (AMP Report No. 42.2R.) (n.a.) OEMsr-945. AMG-New York University. July, 1945.
- 405 Torpedoes**
- 405.1 Aerial**
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- M1** On a problem associated with evasive action by an enemy target. (AMP Report No. 8.6M.) J. Wolfowitz. OEMsr-618. [SRG-Columbia.] April 26, 1943.
- M2** Aircraft torpedo drops. Comparison of model and full-scale results. (Report No. ARL/N.11/H.24.) (n.a.) OSRD Liaison Office No. WA-647-8. Ad-

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- M3** Experimental considerations pertinent to the assessment of aerial torpedo directors. (AMP Memorandum No. 8.7M.) (n.a.) OEMsr-618. SRG-Columbia. March 21, 1944.
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- M5** Speed and height as counterevasive measures for aerial torpedo planes. (AMP Memorandum No. 8.8M.) (n.a.) [OEMsr-618.] SRG-Columbia. June, 1944.
- M6** Lead angles for aerial torpedo attacks against turning ships. (AMP Report No. 8.1R.) (n.a.) OEMsr-618. SRG-Columbia. July, 1944.
- M7** A summary of experimental observations on the deceleration of torpedoes dropped from aircraft. (STR Report No. 376.) G. Grime. OSRD Liaison Office No. WA-3582-1C. Torpedo Experimental Establishment [Great Britain]. September, 1944.
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- M9** Tables of aircraft torpedo lead angles. (AMP Report No. 8.2R.) (n.a.) OEMsr-618. SRG-Columbia. May, 1945.

405.2 Aiming

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- M2** Optimum spread angles for destroyer torpedo salvos. (AMP Report No. 71.1R.) (n.a.) [OEMsr-618.] SRG-Columbia. July, 1944.
- M3** Improved constant bearing method for aiming aerial torpedoes. (AMG Report No. 373.) L. Charles Hutchinson. [OEMsr-1007.] AMG-Columbia. February 23, 1945.
- M4** The apparent lengths of lead method for aiming aerial torpedoes. (AMG Report No. 374.) L. Charles Hutchinson. [OEMsr-1007.] AMG-Columbia. February 26, 1945.

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- M2** A note on the deceleration after entry of an air-

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- M3** The effect of pitch and entry angle on the underwater orbit of Mark 13-2 torpedo as determined by tests with 1.0-inch model. (Division 3. Report No. CIT/IOC-32.) Max Mason and L. B. Slichter. OEMsr-418; OSRD No. 2198. California Institute of Technology. August 28, 1944.
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- M5** Structural damage associated with water entry of projectiles. (Division 3. Report No. CIT/JOC-3.) D. E. Hudson. OEMsr-418; Service Project No. NO-176; OSRD No. 2381. California Institute of Technology. February 15, 1945.
- M6** Full scale trials of 18-inch torpedoes fitted with nose spigot. (Report No. ATDU/3/1945.) (n.a.) OSRD Liaison Office No. WA-4320-3. Aircraft Torpedo Development Unit, Gosport [Great Britain]. March, 1945.
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- M2** Principles underlying the mechanical action of antitorpedo harbor defense nets. (AMP Memorandum No. 67.1.) Herbert J. Greenberg, George H. Handelman and W. Prager. [OEMsr-1066.] AMG-Brown University. September 16, 1943.
- M3** The strain energy absorbed by an antitorpedo harbor defense net. (AMP Memorandum No. 67.2.) Herbert J. Greenberg and W. Prager. [OEMsr-1066.] AMG-Brown University. October 25, 1943.
- M4** Comments on torpedo net design. Project Plan 1943-4. (AMP Memorandum No. 67.3.) (n.a.) [OEMsr-1066.] AMG-Brown University. November 12, 1943.
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- M1** Underwater behavior of 3.5-inch aircraft rockets. (Division 3. Report No. CIT/JBC-23.) Ira S. Bowen. OEMsr-418. California Institute of Technology. December 6, 1943.
- M2** Underwater trajectories of the 3.5-inch aircraft rocket, Model 5. (Division 3. Report No. CIT/JPC-21.) R. V. Adams. OEMsr-418; OSRD No. 2161. California Institute of Technology. June 10, 1944.
- M3** Further investigations of the underwater behavior of aircraft rockets. (Division 3. Report No. CIT/JBC-27.) Ira S. Bowen. OEMsr-418; Service Project Nos. OD-162 and NO-170; OSRD No. 2152. California Institute of Technology. June 26, 1944.
- M4** Underwater behavior of the 11.75-inch aircraft rocket. (Division 3. Report No. CIT/IPC-65.) Ira S. Bowen. OEMsr-418. California Institute of Technology. October 25, 1944.
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500 AERIAL GUNNERY**501 General Reports**

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- M2** [Aerial gunnery problems and plane damage.] Report titled: Lecture by Dr. Edwin Hewitt, Operations Analyst, ORS VIII Bomber Command. (AMG Report No. 195.) [Churchill Eisenhart.] OEMsr-1007. AMG-Columbia. June 14, 1944.
- M3** [Aerial gunnery problems.] Report titled: Certain courses for Study No. 104. (AMG Report No. 227.) (n.a.) [OEMsr-1007.] AMG-Columbia. July 13, 1944.
- M4** Introduction to the aerial gunnery problems of AC-92. (AMG Memorandum No. 2.) John W. Tukey. [OEMsr-1365.] Service Project No. AC-92. AMG-Princeton. August 16, 1944.
- M5** [Computers.] (AMG Report No. 274.) Hassler Whitney. [OEMsr-1007.] AMG-Columbia. October 3, 1944.
- M6** The questions which come up at AMG-C. A summary of various informal requests. (AMG Report No. 313.) (n.a.) [OEMsr-1007.] AMG-Columbia. November 17, 1944.
- M7** [Aerial gunnery problems.] Report titled: Will we do 'em for Bill Duren? (AMG Report No. 326.) [Saunders MacLane.] [OEMsr-1007.] AMG-Columbia. December 7, 1944.
- M8** [Problems of aerial gunnery.] Report titled: Visit to Patuxent, Silver Spring and Washington. (AMG Report No. 330.) Robert M. Thrall. OEMsr-1007. AMG-Columbia. December 12, 1944.
- M9** [Aerial gunnery problems.] Report titled: Further questions which come up at AMG-C. (AMG Report No. 355.) (n.a.) [OEMsr-1007.] AMG-Columbia. January 19, 1945.
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- M11** [Aerial gunnery problems.] Report titled: Washington merry-go-round, or, which spins faster, an electron or a colonel? (AMP Working Paper No. 480.) Saunders MacLane. [OEMsr-1007.] AMG-Columbia. August 11, 1945.
- M12** [Aerial gunnery.] Report titled: Additional questions which come up at AMG-C. (AMG Working Paper No. 481.) Saunders MacLane. [OEMsr-1007.] AMG-Columbia. August 27, 1945.
- M13** Flexible gunnery in the P-61. (AMG Report No. 486.) Samuel Eilenberg. [OEMsr-1007.] AMG-Columbia. August 29, 1945.

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- M3** [The ballistics of aerial gunnery.] Report titled: Revised diary of CE, GAH and RMT. Visit to Aberdeen Proving Ground, August 25 and 26, 1944. (AMG Report No. 258.) (n.a.) [OEMsr-1007.] AMG-Columbia. October 11, 1944.

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- M2** [Sight questions or points.] Report titled: Visierfragen. Theodor Wilhelm Schmidt. OSRD Liaison Office No. WA-5195-9C. April 4, 1941.
- M3** General notes on gun sighting. (Report No. A. P. 1730B. Volume 1, Chapter 1.) (n.a.) OSRD Liaison Office No. II-5-7214(S). Air Ministry [Great Britain]. September, 1942.
- M4** Tail gun computing sight. (Revised.) Edmund B. Hammond, Jr. Sperry Gyroscope Company, Inc. March 16, 1943.
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- M6** Letter to Dr. Warren Weaver. Subject: Fire control problems. (AMP Memorandum No. 72.) Magnus R. Hstenes. [OEMsr-1007.] AMG-Columbia. December 20, 1943.
- M7** Conference with E. Hewitt on flexible gunnery sighting. (AMG Report No. 129.) [Churchill Eisenhart.] [OEMsr-1007.] AMG-Columbia. March 1, 1944.
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- M15** [The use of the AN/APG-1 or -2 on the P-61.] Report titled: Radarlando. Conferences with radar experts at Orlando. (AMG Report No. 279.) Saunders MacLane. [OEMsr-1007.] AMG-Columbia. October 9, 1944.
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- M17** Indexing. [Aiming accuracy.] Report titled: Sir Melville and the vector. (AMG Report No. 255.) Saunders MacLane. [OEMsr-1007.] AMG-Columbia. November 10, 1944.
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- M19** The Eglin Field conference on a figure of merit for gunsights. (AMG Report No. 342.) (n.a.) OEMsr-1007. AMG-Columbia. December 27, 1944.
- M20** A figure of merit for sight-turret performance. (AMG Report No. 343.) Arthur Sard. [OEMsr-1007.] AMG-Columbia. December 29, 1944.
- M21** Trail and gravity offsets for a modified turret. (AMG Report No. 365.) Irving Kaplansky. [OEMsr-1007.] AMG-Columbia. February 8, 1945.
- M22** The transient of a single-gyrosight with fixed sensitivity. (AMG Report No. 406.) Harry Pollard. [OEMsr-1007.] AMG-Columbia. April 24, 1945.
- M23** [Aerial gunnery sights.] Report titled: Washington merry-go-round. April Edition. (AMP Working Paper No. 407.) Saunders MacLane. [OEMsr-1007.] AMG-Columbia. April 25, 1945.
- M24** A suggestion for calibrating PUSS. (AMG Report No. 426.) Irving Kaplansky. [OEMsr-1007.] AMG-Columbia. May 26, 1945.
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- M27** A trainer for rate sights. (AMP Working Paper No. 463.) Magnus R. Hstenes. [OEMsr-1007.] AMG-Columbia. July 17, 1945.
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M34 The theory of an electromagnetically controlled Hooke's joint gyroscope. (AMP Report No. 104.3R.) Donald P. Ling. OEMsr-1007. AMG-Columbia. October, 1945.

M35 Refractive errors in observing an object in the earth's atmosphere. (AMP Working Paper No. 15.) L. Charles Hutchinson. October 31, 1945.

M36 [Gunsighting problems.] (AMG Report No. 238.) (n.a.) [OEMsr-1007.] AMG-Columbia. (n.d.)

M37 Theoretical analysis of the Sperry-Draper sight, K-sight and Sperry stabilized sight. (n.a.) (n.d.)

502.11 K-3, K-4, K-8, K-9, K-12 and K-16

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M2 [The] K-3 and K-4 aircraft sight error analysis. Edmund B. Hammond, Jr. Sperry Gyroscope Company, Inc. May 3, 1944.

M3 The Sperry K-sights. (AMG Report No. 206.) L. Charles Hutchinson. [OEMsr-1007.] AMG-Columbia. June 22, 1944.

M4 The optical system of the K-3 and K-4 sights. (Report No. 104/3.) [L. Charles Hutchinson.] [OEMsr-1007.] [AMG-Columbia.] July 18, 1944.

M5 Sperry sights K-3, K-4 and K-12. (AMG Report No. 236.) L. Charles Hutchinson. [OEMsr-1007.] AMG-Columbia. July 26, 1944.

M6 The behavior of the K-3 sight on support and strafing courses. (AMG Report No. 253.) [Irving Kaplansky.] [OEMsr-1007.] AMG-Columbia. August 14, 1944.

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M8 The assessment of rate sights on pure pursuit courses with special reference to the Sperry K-3. (AMG Report No. 251.) Irving Kaplansky. [OEMsr-1007.] AMG-Columbia. August 16, 1944.

M9 [An overall picture of the status of sights.] Report titled: The current status of Study [No.] 104. (AMG Report No. 266.) Saunders MacLane. [OEMsr-1007.] AMG-Columbia. September 22, 1944.

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280.) Irving Kaplansky. [OEMsr-1007.] AMG-Columbia. October 10, 1944.

M11 [An] APG-5 test with K-3 sight in B-17 No. 6696. H. F. Dunlap. OEMsr-1390; Service Project No. AC-92. University of New Mexico. January 2, 1945.

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502.12 K-10, K-11, K-13, Mark 18 and Mark 25

M1 The service trials of the Mark II gyro gunsight for turrets. (Final Report No. Ex/GRU/47.) (n.a.) OSRD Liaison Office No. II-5-5807(S). [Great Britain.] April 8, 1943.

M2 [Discussion on the behavior of the vector sights.] Report titled: Diary of the meeting between Lt. J. D. Hare, WL and GP on March 23 and 24, 1944. (AMG Report No. 138.) [George Piranian.] [OEMsr-1007.] AMG-Columbia. March 27, 1944.

M3 [Construction details of the Mark 18 gunsight.] Report titled: Diary of GP. (AMG Report No. 175.) [George Piranian.] [OEMsr-1007.] AMG-Columbia. June 16, 1944.

M4 Modification of the Mark 18 gyro gunsight. John B. Russell. July 14, 1944.

M5 The optical system of the Mark 18. (AMG Report No. 261.) L. Charles Hutchinson. [OEMsr-1007.] AMG-Columbia. September 13, 1944.

M6 The behavior of the Mark 18 sight on pure pursuit courses. (AMG Report No. 264.) Irving Kaplansky. [OEMsr-1007.] AMG-Columbia. September 20, 1944.

M7 The calibration of the Mark 18. (AMG Report No. 272.) Irving Kaplansky. [OEMsr-1007.] AMG-Columbia. September 28, 1944.

M8 Maximum deflection in the Mark 18 as limited by the optical system. (AMG Report No. 261/I. Appendix I to AMG Report No. 261.) L. Charles Hutchinson. OEMsr-1007. AMG-Columbia. October 4, 1944.

M9 Analysis of the September, 1944 calibration of the Mark 18. (AMG Report No. 325.) Irving Kaplansky. OEMsr-1007. AMG-Columbia. December 7, 1944.

M10 The Mark 18 as a range finder. (AMG Report No. 339.) Harry Pollard. [OEMsr-1007.] AMG-Columbia. December 18, 1944.

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M12 Bias errors of the Interim Mark 18 (K-15). (AMG

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- M13** The failure of the Mark 18 as a collision course determiner. (AMG Report No. 371.) Harry Pollard. [OEMsr-1007.] AMG-Columbia. February 20, 1945.
- M14** Adaptation of the Mark 18 for 20-mm guns. (AMG Report No. 382.) Irving Kaplansky. [OEMsr-1007.] AMG-Columbia. March 8, 1945.
- M15** Trail offsets of the Mark 18 in a displaced turret. (AMG Report No. 383.) Irving Kaplansky. [OEMsr-1007.] AMG-Columbia. March 13, 1945.
- M16** [The Mark 23 sight.] Report titled: Washington merry-go-round. March Edition. (AMG Report No. 389.) (n.a.) [OEMsr-1007.] AMG-Columbia. March 20, 1945.
- M17** The Mark 18 in a "watermelon" turret. (AMG Report No. 396.) Irving Kaplansky. [OEMsr-1007.] AMG-Columbia. April 3, 1945.
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- M20** Optimum methods of using compensating sights. (AMP Report No. 119.2R.) Daniel Zelinsky. OEMsr-1007. AMG-Columbia. October, 1945.
- M21** The rate sight K-15. A general discussion. (AMG Report No. 500.) Donald P. Ling. [OEMsr-1007.] AMG-Columbia. October, 1945.
- M22** Aerial gunnery and gyrosights. A manual for gunners. (AMP Report No. 104.4R.) Donald P. Ling. OEMsr-1007. AMG-Columbia. October, 1945.
- M23** The optical system of the Mark 18 (K-15) gyro gunsight. Also, an appendix of the tracing of rays through a thick lens or system of lenses. (AMP Report No. 104.5R.) L. Charles Hutchinson. OEMsr-1007. AMG-Columbia. October, 1945.
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- M2** [Analysis and execution of assessment methods for aircraft gunsights of all types.] Report titled: What are the wild shots saying, or, how to tell a bull's eye from a horse. Diary of S. MacLane at Patuxent, May 24 to 27, 1944. (AMG Report No. 184.) Saunders MacLane. [OEMsr-1007.] AMG-Columbia. May 30, 1944.
- M3** Steady state prediction error of the S-8 sight. (Report No. 5252-2009.) O. T. Schultz. Sperry Gyroscope Company, Inc. August 18, 1944.
- M4** [Mark 18 and 21 sights.] Report titled: GP's diary on a visit to Lukas-Harold. (AMG Report No. 263.) [George Piranian.] [OEMsr-1007.] AMG-Columbia. September 14, 1944.
- M5** [A Fairchild S-3 stabilized sight.] Report titled: Visit to Fairchild Camera and Instrument. (AMG Report No. 297.) Daniel Zelinsky. [OEMsr-1007.] AMG-Columbia. November 8, 1944.
- M6** A model calibration for the Mark 21 and Mark 23. (AMG Report No. 320.) Irving Kaplansky. [OEMsr-1007.] AMG-Columbia. November 28, 1944.
- M7** Optimum time of flight for a fighter sight when target flies a circular course. (AMG Report No. 328.) Samuel Eilenberg and Donald P. Ling. [OEMsr-1007.] AMG-Columbia. December 11, 1944.
- M8** [Sights and sighting.] Report titled: Washington Sperry-go-round. (AMG Report No. 349. Addition.) [Saunders MacLane.] [OEMsr-1007.] AMG-Columbia. January 17, 1945.
- M9** Lead formulas for the Fairchild S-3 sight. (AMG Report No. 363.) Magnus R. Hestenes and Daniel Zelinsky. [OEMsr-1007.] AMG-Columbia. February 7, 1945.
- M10** Calibration of the Mark 23 for use with 20-mm guns. (AMG Report No. 377.) Irving Kaplansky. [OEMsr-1007.] AMG-Columbia. March 1, 1945.
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- M12** [Fairchild aerial gunnery sights.] Report titled: Diary of DZ. (AMG Report No. 378.) [Daniel Zelinsky.] [OEMsr-1007.] AMG-Columbia. March 3, 1945.
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- M14** The irrelevance of angle of attack for the Mark 23. (AMG Report No. 386.) Irving Kaplansky. [OEMsr-1007.] AMG-Columbia. March 16, 1945.
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- M19** Preliminary analysis of the S-4 sight. (AMP Working Paper No. 451.) E. R. Lorch and Daniel Zelinsky. [OEMsr-1007.] AMG-Columbia. July 7, 1945.
- M20** The Mark 23 sight. A brief analytical presentation of the principles of the pilot's gyro gun and rocket

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M9 Camera evaluation of bomber gunsights. (AMP Report No. 142.1R.) A. Adrian Albert. OEMsr-1379. AMG-Northwestern University. July, 1945.

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M11 A suggestion for camera measurement of skid. (AMG Report No. 473.) Irving Kaplansky. OEMsr-1007. AMG-Columbia. July 31, 1945.

M12 Computational procedures and forms for camera assessment of fighter plane gunsights. (AMG Re-

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M2 Possibility of serial correlation increasing the probability of at least one hit. (SRG Report No. 365.) [Rollin F. Bennett.] [OEMsr-618.] SRG-Columbia. November 25, 1944.

M3 Dispersion patterns in fire from moving aircraft. (AMG Report No. 18.) George Piranian. [OEMsr-1379.] AMG-Northwestern University. December 5, 1944.

M4 A simple figure of merit. (AMG Report No. 334.) Arthur Sard. [OEMsr-1007.] AMG-Columbia. December 13, 1944.

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- M2** [Controlling plane-to-plane fire.] Report titled: Diary of WL. Conference of JBR, SM, WL with SHC, September 21, 1943. (AMG Report No. 69.) Walter Leighton. [OEMsr-1007.] AMG-Columbia. September 23, 1943.
- M3** [Fire control apparatus.] Report titled: Diary of SM. Conference of SRC, HW and SM. (AMG Report No. 90.) [Saunders MacLane.] [OEMsr-1007.] AMG-Columbia. November 16, 1943.
- M4** The stability of blind firing systems. (Report No. GRU/M.8.) C. W. Gilbert. OSRD Liaison Office No. II-5-5927(S). Gunnery Research Unit, Exeter [Great Britain]. March 14, 1944.
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- M6** Conference at Sperry Gyroscope regarding the ball turret problem. (AMG Report No. 187.) James J. Stoker. [OEMsr-1007.] AMG-Columbia. May 31, 1944.
- M7** Weaveron fire control. (Excerpts from AMG Report No. 178.) (n.a.) [OEMsr-1007.] AMG-Columbia. [June, 1944.]
- M8** [Use of radar equipment in plane-to-plane fire control.] Report titled: Visit to Radiation Laboratory at Massachusetts Institute of Technology. Diary of BHB and LCH. (AMG Report No. 207.) [L. Charles Hutchinson.] [OEMsr-1007.] AMG-Columbia. June 20, 1944.
- M9** [Fire control system of B-29 tactics.] Report titled: Diary of IK and MRH. GE visit June 9 and 10, 1944. (AMG Report No. 197.) [Irving Kaplansky and Magnus R. Hestenes.] [OEMsr-1007.] AMG-Columbia. June 26, 1944.
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- M11** [Fire control.] Report titled: Diary of RMT, November 21-22 including visit to the Pentagon and the Navy Building. (AMG Report No. 319.) (n.a.) [OEMsr-1007.] AMG-Columbia. November 27, 1944.
- M12** [Testing the fire control system of the B-29.] Report titled: Diary, Brownsville-Albuquerque. (AMG Report No. 341.) Hassler Whitney. [OEMsr-1007.] AMG-Columbia. December 26, 1944.
- M13** Harmonization studies for the B-29 airplane. (AMP Report No. 186.1R [from] September, 1944 [to] April, 1945.) (n.a.) OEMsr-1365; Service Project No. AC-92; OSRD No. 5242. AMG-Princeton. April, 1945.
- M14** [Fire control.] Report titled: Diary of Arthur Sard, April 10-12, 1945. (AMP Working Paper No. 402.) Arthur Sard. [OEMsr-1007.] AMG-Columbia. April 18, 1945.
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- M2** [Mathematical problems on fire control.] Report titled: A visit to Section T. (AMG Report No. 185.) Saunders MacLane. [OEMsr-1007.] AMG-Columbia. May 31, 1944.
- M3** The stereographic spherimeter. (AMP Memorandum No. 107.1M.) L. Charles Hutchinson and John H. Lewis. OEMsr-1007. AMG-Columbia. January, 1945.
- M4** Correction for roll, pitch and yaw with the spherimeter. (AMP Memorandum No. 107.2M.) L. Charles Hutchinson and John H. Lewis. OEMsr-1007. AMG-Columbia. February, 1945.
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- M2** Simple formulas to fit the values tabulated in the firing tables FT 0.50 AC-M-1. (AMP Memorandum No. 104.1.) George Piranian. OEMsr-1007. AMG-Columbia. April 6, 1944.
- M3** Some uses of variable speed mechanisms in fire control. (AMP Memorandum No. 103.1.) Magnus R. Hestenes. OEMsr-1007. AMG-Columbia. April 14, 1944.
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- M5** Sequential analysis of test firing data. (AMG Report No. 173.) Churchill Eisenhart. [OEMsr-1007.] AMG-Columbia. May 20, 1944.
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- M7** Conferences on the determination of a merit index for fire control systems. (AMG Report No. 219.) [Churchill Eisenhart.] [OEMsr-1007.] AMG-Columbia. July 6, 1944.
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M10 Proposal for a sight for turrets with velocity tracking. (AMG Report No. 210.) Hassler Whitney. [OEMsr-1007.] AMG-Columbia. June 22, 1944.

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M20 Notes on the tracking problem for fighter planes. (AMG Report No. 329.) Hassler Whitney. [OEMsr-1007.] AMG-Columbia. December 13, 1944.

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- M23** Amplification of tracking noise in the gunsight Mark 18. (AMG Report No. 372.) Donald P. Ling. [OEMsr-1007.] AMG-Columbia. February 21, 1945.
- M24** Tracking and fire control problem. (AMG Report No. 375.) Hassler Whitney. [OEMsr-1007.] AMG-Columbia. March 2, 1945.
- M25** Ranging in defense of the B-29 against nose attacks. (AMG Report No. 394.) Daniel C. Lewis. [OEMsr-1007.] AMG-Columbia. April 3, 1945.
- M26** The use of range rate in a fighter gunsight. (AMP Working Paper No. 450.) Irving Kaplansky. [OEMsr-1007.] AMG-Columbia. June 30, 1945.
- M27** Airborne tracking and ranging errors. (AMP Memorandum No. 166.2M.) Arthur Sard. OEMsr-1007. AMG-Columbia. October, 1945.

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- M2** A note on lateral and vertical deflections for a caliber 0.50 projectile in plane-to-plane fire. (AMP Memorandum No. 57.2.) (n.a.) [OEMsr-1007.] AMG-Columbia. February, 1944.
- M3** What per cent of own-speed deflection? (AMP Report No. 119.1R.) Gustav A. Hedlund. [OEMsr-1007.] AMG-Columbia. November, 1944.
- M4** Average percentages of own-speed deflection. (AMP Memorandum No. 119.1M.) Daniel Zelinsky and M. J. Lewis. OEMsr-1007. AMG-Columbia. January, 1945.
- M5** The air mass coordinate method of aerial gunnery assessment. E. G. Pickels. February 15, 1945.
- M6** Experimental verification of optimum percentages of own-speed lead. (AMP Working Paper No. 439.) Arthur Sard and Daniel Zelinsky. OEMsr-1007. AMG-Columbia. June 11, 1945.
- M7** Deflection formulas for gunsights of the Mark 18-type. (AMG Report No. 358. Revised.) Donald P. Ling. OEMsr-1007. AMG-Columbia. June 26, 1945.
- M8** Deflection formulas for airborne fire control. (AMP Report No. 104.2R.) Magnus R. Hestenes. OEMsr-1007. AMG-Columbia. October, 1945.

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- M2** Tables of errors committed when using N-8 sight with position firing rules against three pure pursuit courses. (AMG Report No. 234.) (n.a.) [OEMsr-1007.] AMG-Columbia. July 21, 1944.
- M3** A simple method of computing the future position corresponding to a given present position.

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- M4** [The errors made when position firing rules are applied.] Report titled: Supplement to AMG-C No. 234. (AMG Report No. 234a.) Herbert Solomon. [OEMsr-1007.] AMG-Columbia. October 11, 1944.
- M5** Position firing deflections corresponding to arbitrary angles off. (AMG Report No. 322.) [Herbert Solomon and Churchill Eisenhart.] [OEMsr-1007.] AMG-Columbia. December 6, 1944.
- M6** An empirical verification of position firing. (AMG Report No. 323.) [Herbert Solomon and Churchill Eisenhart.] [OEMsr-1007.] AMG-Columbia. December 18, 1944.
- M7** Position firing rules for the A-26. (AMP Memorandum No. 119.2M.) Daniel Zelinsky. OEMsr-1007. AMG-Columbia. March, 1945.
- M8** Simple rules for support fire with a vector sight. Level and related attacks. (AMP Memorandum No. 157.1M.) Charles Nichols. OEMsr-1379. AMG-Northwestern University. May, 1945.
- M9** Position firing rules for various altitudes and speeds. (AMG Report No. 422.) Samuel Eilenberg. [OEMsr-1007.] AMG-Columbia. May 23, 1945.
- M10** A note on recalculated position firing rules for the A-26. (AMP Working Paper No. 446.) Daniel Zelinsky. [OEMsr-1007.] AMG-Columbia. June 26, 1945.
- M11** On apparent speed firing. (AMP Memorandum No. 157.2M.) Charles Nichols. OEMsr-1379. AMG-Northwestern University. September, 1945.

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- M2** The General Electric 2CH1C1 and 2CH1D1 computer. (AMG Report No. 333.) Magnus R. Hestenes, Daniel C. Lewis and F. J. Murray. OEMsr-1007. AMG-Columbia. December 13, 1944.
- M3** Ground tests of the B-29 central fire control system. (Report No. UNM/W/TR5.) W. D. Crozier. OEMsr-1390; Service Project No. AC-92. University of New Mexico. January 15, 1945.
- M4** A suggestion for improving the performance of the B-29 2CH1C1 computer. (AMG Report No. 391.) Magnus R. Hestenes and Daniel C. Lewis. OEMsr-1007. AMG-Columbia. March 24, 1945.
- M5** Further modifications of the B-29 fire control computer. (AMG Report No. 391a.) Magnus R. Hestenes and Daniel C. Lewis. [OEMsr-1007.] AMG-Columbia. March 27, 1945.
- M6** Summary of results of testing a B-29 fire control computer total correction motor. (AMP Working Paper No. 409.) Daniel C. Lewis. [OEMsr-1007.] AMG-Columbia. May 4, 1945.
- M7** A proposal for improving the nose computer per-

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- M2** Analysis of fire power of a squadron of four B-29 airplanes. (Technical Report No. 2.) (n.a.) [OEMsr-1381,] Service Project No. AC-92. Mount Wilson Observatory. September 30, 1944.
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- M2** [Fighter attacks on a bomber.] Report titled: Preliminary notes on evaluation, No. 2. (AMP Memorandum No. 2.3.) (n.a.) [OEMsr-618.] SRG-Columbia. October 26, 1942.
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- M5** [Fighter attacks against a bomber.] Report titled: Mathematical Note No. 3. (AMP Memorandum No. 2.9.) J. Wolfowitz. [OEMsr-618.] SRG-Columbia. December 1, 1942.
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- M2** Tracer stereographs. Diary of D. C. Lewis for September 15, 16 and 17, 1943. Visit to Camp Davis, Hollyridge, N. C. (AMP Memorandum No. 45.3.) Daniel C. Lewis. [OEMsr-1007.] AMG-Columbia. September, 1943.
- M3** Letter to Antiaircraft Artillery Board, Camp Davis, North Carolina. Subject: Door plane. (AMG Report No. 78.) Daniel C. Lewis. [OEMsr-1007.] AMG-Columbia. October 23, 1943.
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- M5** On the significance of the Stibitz superposition approximation in the case of modified and unmodified vertical alignment. (AMG Report No. 98.) Daniel C. Lewis. [OEMsr-1007.] AMG-Columbia. November 25, 1943.
- M6** A system for obtaining great circle fixes by use of stereographic grids or maps. (AMP Report No. 74.1.) E. J. Moulton and John H. Lewis. [OEMsr-1007.] AMG-Columbia. December, 1943.
- M7** [Tracer stereographs.] Report titled: Diary of D. C. Lewis for November 24, 25 and 26, 1943. Visit to Camp Davis, Hollyridge, North Carolina. (AMG Report No. 97.) Daniel C. Lewis. [OEMsr-1007.] AMG-Columbia. December 2, 1943.
- M8** Tracer stereographs. (AMP Report No. 45.1.) (n.a.) [OEMsr-1007.] OSRD No. 3316. AMG-Columbia. January, 1944.
- M9** Tracer stereographs with vertical base line. (Appendix to AMP Report No. 45.1R, OSRD Report No. 3316.) Daniel C. Lewis. (n.d.)

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- M2** Errors in slant range of the 90-mm gun as affected by errors in estimating muzzle velocity. (AMG Report No. 62.) (n.a.) [OEMsr-1007 and OEMsr-618.] AMG-Columbia and SRG-Columbia. November, 1943.
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- M4** Table for the 40-mm gun. (AMG Report No. 111.) Magnus R. Hestenes. [OEMsr-1007.] AMG-Columbia. January 12, 1944.
- M5** The variable a for the 5-inch gun. (AMG Report No. 112.) Magnus R. Hestenes. [OEMsr-1007.] AMG-Columbia. January 14, 1944.
- M6** Conference on the subject of proof tests for artillery ammunition. (AMG Report No. 116.) Edward Paulson and James J. Stoker. [OEMsr-1007.] AMG-Columbia. January 20, 1944.

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- M9** Prediction of fuze setting. (AMP Report No. 85.1R.) F. J. Murray and Arthur Sard. [OEMsr-1007.] AMG-Columbia. August, 1944.
- M10** The fuze dead-time circuit of R. M. Elliot. The smoothing effect of a follow-up motor. (AMG Report No. 257.) Arthur Sard. [OEMsr-1007.] AMG-Columbia. August 24, 1944.
- M11** Air-to-air bombing probabilities for three types of fuze. (SRG Report No. 69.) (n.a.) [OEMsr-1365.] AMG-Princeton. October 26, 1944.
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- 705.1 Efficacy**
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- M2** Conference on the mathematical aspects of probability of damage studies, Washington, April 16, 1943. (AMP Note No. 2.) (n.a.) April, 1943.
- M3** Comparative effectiveness of 5-inch shrapnel, 40-mm high explosive and 20-mm high explosive against directly approaching aircraft. (AMP Report No. 27.1.) (n.a.) [OEMsr-618.] SRG-Columbia. August, 1943.
- M4** Effectiveness of heavy antiaircraft fire as a function of target altitude. (AMG Report No. 46.) Daniel C. Lewis. [OEMsr-1007.] AMG-Columbia. September 6, 1943.
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- 800 BOMBING**
- 801 Computations**
- 801.1 Probabilities of Hits**
- M1** Probabilities, when the dispersion is statistically uniform. (AMP Memorandum No. 11.4.) H. H. Germond. February 2, 1943.
- M2** Bombing attacks in which the results may be assessed continuously. (AMP Memorandum No. 11.11.) (n.a.) July 5, 1943.
- M3** Methods of estimating standard errors of aiming from operational data. (AMP Report No. 11.9.) Jerzy Neyman. [OEMsr-817; OSRD No. 3342.] University of California. January, 1944.
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- M5** Probabilities of at least one, two, three, four and five hits on rectangular targets in train bombing when the dispersion is equal to the target width.

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- M2** An empirical verification of tables on multiple hits. (AMP Report No. 11.7.) Mark W. Eudey. {OEMsr-817,} University of California. August 10, 1943.
- M3** Observations concerning multiple attack and multiple hit theory. (AMP Memorandum No. 11.12.) Jan Schilt. Columbia University. September, 1943.
- M4** Note on mission planning against multiple targets. (BRG Report No. 82.) (n.a.) {OEMsr-818,} {BRG-Columbia,} (n.d.)
- M5** Note on the spacing for group attacks and multiple hits. (BRG Report No. 83.) Jan Schilt. OEMsr-818. BRG-Columbia. (n.d.)
- 801.3 Spacing**
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- M2** Design of a bomb spacing calculator. (BRG Report No. 100.) H. H. Germond. {OEMsr-818,} BRG-Columbia. April 26, 1944.
- 801.4 Target Plates**
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- M2** Photometric measurements with a complementary target plate. (AMP Memorandum No. 11.3.) H. H. Germond. January 17, 1943.
- M3** Design of a Gaussian shutter. (AMP Memorandum No. 11.8.) H. H. Germond. February, 1943.
- M4** Gray targets versus diffuse targets. (AMP Memorandum No. 11.5.) H. H. Germond. February 2, 1943.
- M5** Method for the rapid production of approximate diffuse target plates. (AMP Memorandum No. 11.7.) H. H. Germond. February 21, 1943.
- M6** A two-tone target. (AMP Memorandum No. 11.10M.) H. H. Germond. February 28, 1943.
- M7** A target plate camera. (AMP Memorandum No. 11.9.) H. H. Germond. March 23, 1943.
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- M1** On correction of time delays in bombsights. (AMG Report No. 151.) Leon Brillouin. {OEMsr-1007,} AMG-Columbia. April 20, 1944.
- M2** {Tests to be made on the various models of British angular rate bombing (BARB),} Report titled: Diary of S. MacLane. Visit to Patuxent, April 21, 1944. (AMG Report No. 158.) Saunders MacLane. {OEMsr-1007,} AMG-Columbia. April 24, 1944.
- M3** {General objectives of a mathematical assessment program for lead computing sights,} Report titled: The probability that Caldwell is right. (AMG Report No. 167.) Saunders MacLane. {OEMsr-1007,} AMG-Columbia. May 16, 1944.
- M4** Range errors resulting from incorrect ground speed setting in BARB, British angular rate bombing {during,} horizontal flight. (AMG Report No. 191.) L. Charles Hutchinson. {OEMsr-1007,} AMG-Columbia. June 5, 1944.
- M5** On ground speed measurement on a plane. (AMG Report No. 214.) Leon Brillouin. {OEMsr-1007,} AMG-Columbia. June 30, 1944.
- M6** Air testing sample bombsights. (AMP Report No. 5.1R.) Harold Hotelling. {OEMsr-618,} SRG-Columbia. November, 1944.
- M7** A simple sight for dropping bombs or torpedoes, TABS, torpedo and bomb sight. (AMG Report No. 397.) L. Charles Hutchinson. {OEMsr-1007,} AMG-Columbia. April 3, 1945.
- M8** Analysis of range errors of a bombsight. (AMG Report No. 193.) Saunders MacLane. {OEMsr-1007,} AMG-Columbia. (n.d.)
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- 803.1 Train Bombing**
- M1** A study of train bombing. (AMP Report No. 11.1R.) (n.a.) OEMsr-65; Service Project No. AC-27. Princeton University. August 25, 1942.
- M2** Proposed technique for the determination of the

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- M3** Study of the seriousness of the effects, in the planning and executing of bombing missions, of misestimates of the standard errors of aiming and dispersion. (AMP Report No. 11.2R.) (n.a.) January 12, 1943.
- M4** The probabilities of hitting, in train bombing, rectangular targets of proportion one-by-six or one-by-nine. (AMP Report No. 11.3R.) (n.a.) March 10, 1943.
- M5** Theory of multiple hits on multiple targets in train bombing. (AMP Report No. 11.4.) Jerzy Neyman. University of California. May 10, 1943.
- M6** The design of a certain experiment. (AMG Report No. 30.) Churchill Eisenhart. [OEMsr-1007.] AMG-Columbia. July 28, 1943.
- M7** The effects of failing to make a correction of trail in train bombing so as to place the center of train on the center of target. (AMP Report No. 11.6.) Evelyn Fix. University of California. August 10, 1943.
- M8** Train bombing. An outline of principal results of statistical studies conducted by the Applied Mathematics Panel. (AMP Report No. 11.5.) (n.a.) August 12, 1943.
- M9** Tables of probabilities of at least one, two, three, four and five hits on rectangular targets in train bombing. (AMP Report No. 11.10R.) (n.a.) [OEMsr-818.] BRG-Columbia. June, 1944.
- M10** The character of the train-bombing probability curve at the point for zero spacing. (BRG Report No. 112.) John D. Williams. [OEMsr-818.] [BRG-Columbia.] June 16, 1944.
- M11** Note on the direction of attack with a train of n bombs when the aiming errors in range and deflection are unequal. (BRG Report No. 116.) (n.a.) [OEMsr-818.] [BRG-Columbia.] (n.d.)

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- M2** Area bombing. Probability of hitting a given percent of all sections. (AMG Report No. 186.) H. H. Germond. [OEMsr-860.] AMG-Columbia. May 28, 1944.
- M3** Cooperative study on area bombing. Mark W. Eudey, Evelyn Fix and others. [OEMsr-817.] University of California. June 11, 1944.
- M4** Area bombing probabilities. (AMP Report No. 11.12R.) H. H. Germond. [OEMsr-1007 and OEMsr-818.] AMG-Columbia and BRG-Columbia. July, 1944.
- M5** [A stochastic model of incendiary raids.] (Progress Report No. 3.) Jerzy Neyman. University of California. February 28, 1945.

- M6** Distribution of the percentage of hits when uniform square bomb patterns are dropped on rectangular targets. (AMP Report No. 184.1R.) (n.a.) OEMsr-860. SRG-Princeton. April, 1945.
- M7** Dependence of the percentage of hits on pattern area and mean radial error, derived from operational data on formation bombing. (AMP Report No. 174.1R.) (n.a.) OEMsr-860. SRG-Princeton. July, 1945.
- M8** A coverage problem associated with bombing. (AMP Memorandum No. 173.1M.) (n.a.) OEMsr-860. SRG-Princeton. October, 1945.
- M9** An empirical determination of the dependence of pattern area and mean radial aiming error on certain operating factors in formation bombing. (AMP Report No. 174.2R.) (n.a.) OEMsr-860. SRG-Princeton. October, 1945.

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- M1** Notes on low-altitude bombing. [Part] I, Range errors for angular depression and angular rate methods. (Division 7. AMP Memorandum No. 35.1M.) (n.a.) May 24, 1943.
- M2** Notes on low-altitude bombing. [Part] II, Effect of a rangewise impact-point offset on range errors for angular depression and angular rate methods. (AMP Memorandum No. 35.2M.) (n.a.) June 2, 1943.
- M3** Notes on low-altitude bombing. [Part] III, Practical evaluation of composite range errors for angular depression and angular rate methods. (AMP Memorandum No. 35.3M.) (n.a.) June 15, 1943.
- M4** Notes on low-altitude bombing. [Part] IV, Range errors for the slant range method. (AMP Memorandum No. 35.4M.) (n.a.) July 30, 1943.
- M5** Notes on low-altitude bombing. [Part] V, Range errors for the angular rate hybrid method. (AMP Memorandum No. 35.5M.) (n.a.) July 30, 1943.
- M6** Notes on low-altitude bombing. [Part] VI, Range errors for angular depression and angular rate methods in glide bombing. (AMP Memorandum No. 35.6M.) (n.a.) September 11, 1943.
- M7** The problem of optimum spacing in low-altitude APQ-5 train bombing. (AMP Memorandum No. 11.15M.) (n.a.) OEMsr-860. SRG-Princeton. July, 1945.

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- M1** Scatter bombing computations. (Division 7. Report to the Services No. 34.) H. H. Germond and Cecil Hastings, Jr. July 27, 1943.
- M2** Scatter bombing of a circular target. (AMP Report No. 10.2R.) H. H. Germond and Cecil Hastings, Jr. OEMsr-818 and OEMsr-1007; OSRD No. 4572. AMG-Columbia and BRG-Columbia. May, 1944.
- M3** Scatter bombing of bomber strips. (BRG Report No. 106.) John D. Williams. BRG-Columbia. May 28, 1944.

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- M2** Air-to-air bombing. (SRG Report No. 61.) (n.a.) [OEMsr-860.] SRG-Princeton. September 23, 1944.
- M3** Toss bombing with target motion. (AMG Report No. 293.) Harry Pollard. [OEMsr-1007.] AMG-Columbia. October 24, 1944.
- M4** The use of H in toss bombing. (AMG Report No. 344.) Harry Pollard. [OEMsr-1007.] AMG-Columbia. December 29, 1944.
- M5** Release conditions in toss bombing. (AMG Report No. 360.) Harry Pollard. [OEMsr-1007.] AMG-Columbia. January 27, 1945.
- M6** Toss bombing a moving target. (AMG Report No. 364.) Harry Pollard. [OEMsr-1007.] AMG-Columbia. February 7, 1945.
- M7** [Mechanizations of a toss bombsight.] Report titled: The air goes round and round and comes out here. (AMG Report No. 385.) Saunders MacLane. [OEMsr-1007.] AMG-Columbia. March 15, 1945.
- M8** A theory of toss bombing. (AMP Working Paper No. 411.) Harry Pollard. [OEMsr-1007.] AMG-Columbia. May 8, 1945.
- M9** A solution of the azimuth problem in toss bombing. (AMP Working Paper No. 438.) Harry Pollard. [OEMsr-1007.] AMG-Columbia. June 9, 1945.
- M10** Proposal for an acceleration integrator. (AMP Working Paper No. 447.) Hassler Whitney. [OEMsr-1007.] AMG-Columbia. June 28, 1945.
- M11** A modified release condition for toss bombing. (AMG Report No. 476.) Harry Pollard. [OEMsr-1007.] AMG-Columbia. August 8, 1945.
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- M13** The azimuth problem in toss bombing. (AMG Report No. 495.) Harry Pollard. [OEMsr-1007.] AMG-Columbia. September 18, 1945.

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- M1** A new vulnerability equation in the analysis of incendiary raids. (Report No. REN-471.) Jerzy Neyman and J. Bronowski. OSRD Liaison Office No. WA-3924-14. Ministry of Home Security [Great Britain]. December 1, 1944.

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- M1** Data relating to attacks on merchant vessels and tankers. (AMG Report No. 31.) Churchill Eisenhart. [OEMsr-1007.] AMG-Columbia. August 5, 1943.
- M2** The proposed study of data in the files of the

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- M3** Statistical analysis of ship damage. (AMP Memorandum No. 39.1.) Churchill Eisenhart. [OEMsr-1007.] AMG-Columbia. November, 1943.
- M4** Proof that the optimum spacing for sinking probabilities is independent of the number of attacks. (BRG Report No. 109.) John D. Williams. [OEMsr-818.] BRG-Columbia. February 6, 1944.
- M5** Note on sinking probabilities. (BRG Report No. 89.) [James J. Stoker.] [OEMsr-818.] BRG-Columbia. (n.d.)

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- M1** Effectiveness of large blast bombs against German housing. (AMP Memorandum No. 190.4M.) Jerzy Neyman. OEMsr-817. University of California. September, 1945.
- M2** Study of the effectiveness of incendiary-bomb aerial attacks on German industrial targets. [Part I, Probability of M-47 starting a serious fire in an industrial building. (AMP Memorandum No. 190.1M.) E. W. Barankin, E. R. Dempster and others. OEMsr-817. University of California. September, 1945.
- M3** Study of the effectiveness of incendiary-bomb aerial attacks on German industrial targets. [Part II, Analysis of Royal Air Force area attack of 22/23 October, 1943, on Kassel with special reference to effectiveness of the M-50 magnesium bomb in setting fire to industrial buildings. (AMP Memorandum No. 190.2M.) Evelyn Fix. OEMsr-817. University of California. September, 1945.
- M4** Study of the effectiveness of incendiary-bomb aerial attacks on German industrial targets. [Part III, Summary report on fire raising effectiveness of incendiary bombs M-47 and M-50 used against German industrial targets. (AMP Memorandum No. 190.3M.) Leo A. Aroian, E. W. Barankin and others. OEMsr-817. University of California. September, 1945.

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- M2** High-level and medium-level bridge bombing. (AMP Memorandum No. 11.14M.) R. I. Wolff. [OEMsr-818.] BRG-Columbia. July, 1944.
- M3** Bomb damage. (Second Progress Report.) Mary L. Shane. OEMsr-817; Service Project No. AN-23. University of California. February 16, 1945.
- M4** Photoelectric instrument for rapid bomb-fall analysis and damage prediction. (AMP Report No. 190.1R.) Derrick H. Lehmer. OEMsr-817. University of California. May, 1945.

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- M1** Analysis of operation of heat-homing devices during March, 1944. (AMP Report No. 127.1R.) (n.a.) SRG-Princeton. June, 1944.
- M2** Analysis of operation of heat-homing devices near St. Louis and Nashville on April 25, 1944. (AMP Report No. 127.2R.) (n.a.) SRG-Princeton. August, 1944.
- M3** Analysis of operation of heat-homing devices during May, 1944. (AMP Report No. 127.3R.) (n.a.) SRG-Princeton. September, 1944.
- M4** Analysis of operation of heat-homing devices, May 31 to June 24, 1944. (AMP Report No. 127.4R.) (n.a.) SRG-Princeton. November, 1944.
- M5** Analysis of operation of heat-homing devices after April, 1944. (AMP Report No. 127.5R.) (n.a.) SRG-Princeton. January, 1945.
- M6** Analysis of operation of Felix heat-homing device over targets near Boston, Massachusetts, during October, 1944 and January, 1945. (AMP Report No. 112.1R.) (n.a.) OEMsr-860. SRG-Princeton. April, 1945.

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- M1** Increased risk in extending a bomb run. (AMP Report No. 6.1.) (n.a.) [OEMsr-618.] SRG-Columbia. January 25, 1943.
- M2** Some quantitative information which bears on the general problem of bombing systems. (AMP Memorandum No. 11.13.) (n.a.) September 30, 1943.
- M3** Note on determination of aiming points and number of bombs for bombing operations. (AMP Note No. 17.) (n.a.) OEMsr-860; OSRD No. 5317. SRG-Princeton. June, 1945.
- M4** Analytical and statistical studies of certain guided missiles. (AMP Report No. 112.2R.) (n.a.) OEMsr-860. SRG-Princeton. October, 1945.

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- M1** Estimation of balloon barrage probabilities and similar problems. (AMP Report No. 12.1.) (n.a.) May 14, 1943.
- M2** A quantitative aspect of combat. (AMP Note No. 6.) B. O. Koopman. [OEMsr-1007.] AMG-Columbia. August, 1943.
- M3** Strength and compressibility of pads of tubular fibres to be used in clothing. (AMP Report No. 81.1.) James J. Stoker. [OEMsr-1007.] AMG-Columbia. December, 1943.
- M4** Some mathematical principles of blockade patrol. (AMP Memorandum No. 80.2.) B. O. Koopman. [OEMsr-1007.] AMG-Columbia. December, 1943.
- M5** Solution of a non-linear integral equation appearing in the theory of an aerosol. (AMP Memorandum No. 100.1M.) (n.a.) [OEMsr-945.] AMG-New York University. April, 1944.
- M6** Symposium, June 15, 16 and 17, 1944, at the Massachusetts Institute of Technology on confidential airborne electronic equipment. (n.a.) [MIT] Radiation Laboratory. [June, 1944.]

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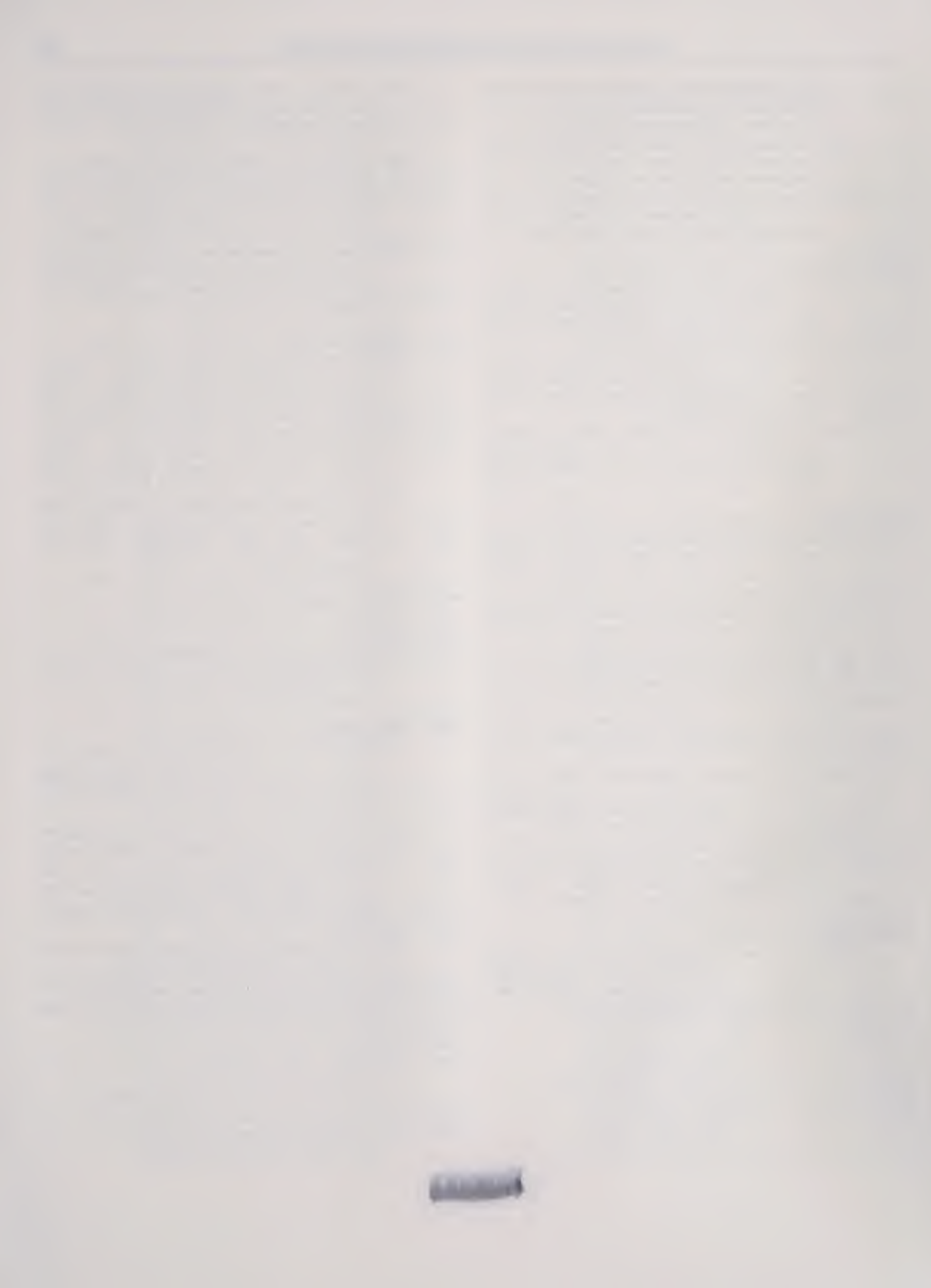
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218.1 Theoretical Factors

- M1** Voice communication courses. Volume I, Handbook for instructors. Volume II, Course outlines and drills for individual training. Volume III, Course outlines and drills for crew training. (Memorandum Nos. 13 to 15.) Foster C. Shoup, I. P. Brackett and others. OEMsr-830; Service Project No. SC-67. The Psychological Corporation. July, 1945.
- M2** Summary of work on the selection and training of telephone talkers. (Report No. 19.) Louis A. Mallory and William J. Temple. OEMsr-830; Service Project No. N-109(1); OSRD No. 5497. The Psychological Corporation. August 27, 1945.
- M3** Summary of work on voice communication. (Report No. 21.) John W. Black. OEMsr-830; Service Project No. SC-67; OSRD No. 5568. The Psychological Corporation. September 11, 1945.
- M4** Facts about voice communication. (n.a.) [OEMsr-830;] Service Project No. SC-67. The Psychological Corporation. (n.d.)

218.2 Intelligibility

- M1** Methods of training telephone talkers for increased intelligibility. (Report No. 4.) John C. Snidecor, Louis A. Mallory and Edward L. Hearsey. OEMsr-830; Service Project Nos. N-109(1) and SC-67; OSRD No. 3178. The Psychological Corporation. January 28, 1944.
- M2** Studies of voice factors affecting the intelligibility of voice communication in noise. Relation between loudness of voice and the intelligibility of airplane interphone communication. (Report No. 5.) James F. Curtis. OEMsr-830; Service Project Nos. N-109(1) and SC-67; OSRD No. 3313. The Psychological Corporation. February, 1944.
- M3** The relative intelligibility of typical methods of holding the T-17 microphone for communication in noise. (Report No. 6.) (n.a.) OEMsr-830; Service Project Nos. N-109(1) and SC-67; OSRD No. 3505. The Psychological Corporation. May, 1944.
- M4** Intelligibility measurement. Techniques and procedures used by the Voice Communication Laboratory. (Report No. 7.) C. Hess Haagen. OEMsr-830; Service Project Nos. N-109(1) and SC-67; OSRD No. 3748. The Psychological Corporation. May, 1944.
- M5** Training studies in voice communication. [Part] I, Can intelligibility of voice communication be increased by training in voice technique? (Report No. 8.) James F. Curtis, I. P. Brackett and others. OEMsr-830; Service Project Nos. N-109(1) and SC-67; OSRD No. 3862. The Psychological Corporation. July 5, 1944.
- M6** Training studies in voice communication. [Part] II, The use of noise in a training program. (Report

No. 12.) James F. Curtis. OEMsr-830; Service Project No. SC-67; OSRD No. 4261. The Psychological Corporation. October 18, 1944.

- M7** Phonetic characteristics of words as related to their intelligibility in aircraft-type noise. (Report No. 13.) Harry M. Mason. OEMsr-830; Service Project No. SC-67; OSRD No. 4681. The Psychological Corporation. February 10, 1945.
- M8** Phonetic characteristics related to intelligibility of words in noise. Sounds correctly understood in misunderstood words. (Report No. 15.) Harry M. Mason. OEMsr-830; Service Project Nos. SC-67; OSRD No. 5174. The Psychological Corporation. June 6, 1945.
- M9** Studies of voice factors affecting the intelligibility of voice communication in noise. [Part] II, Pitch. (Report No. 16.) I. P. Brackett, C. Horton Talley and Harry M. Mason. OEMsr-830; Service Project No. SC-67; OSRD No. 5413. The Psychological Corporation. August 4, 1945.
- M10** Intelligibility measurement [in] twelve-word tests. (Report No. 17.) C. Hess Haagen. OEMsr-830; Service Project No. SC-67; OSRD No. 5414. The Psychological Corporation. August 4, 1945.
- M11** Training studies in voice communication. [Part] III, Effects of training in articulation. (Report No. 18.) C. Hess Haagen, James F. Curtis and others. OEMsr-830; Service Project No. SC-67; OSRD No. 5461. The Psychological Corporation. August 20, 1945.
- M12** Intelligibility measurement [by] twenty-four word multiple-choice tests. (Report No. 20.) C. Hess Haagen. OEMsr-830; Service Project No. SC-67; OSRD No. 5567. The Psychological Corporation. September 11, 1945.

218.3 Telephone Talkers

- M1** Seminar in telephone talking and composition of manual for the use of sound-powered phones. (Memorandum No. 1.) John C. Snidecor. OEMsr-830; Service Project No. N-109. The Psychological Corporation. September 28, 1943.
- M2** Information regarding an analysis of recordings made from the telephone circuits on board a battleship and a destroyer. (Memorandum No. 3.) (n.a.) OEMsr-830; Service Project Nos. N-109(1) and SC-67; OSRD No. 3312. The Psychological Corporation. February, 1944.
- M3** Experimental investigation of a course for telephone talkers. (Report No. 9.) George W. Hibbitt and Louis A. Mallory. OEMsr-830; Service Project Nos. N-109(1) and SC-67; OSRD No. 3863. The Psychological Corporation. July 4, 1944.
- M4** [Submarine telephone talker training.] The status of Project N-109. George K. Bennett. [OEMsr-830;] Service Project No. N-109. The Psychological Corporation. September 16, 1944.

218.31 Interviewers for Classification

- M1** A preliminary study of the abilities of rated men

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to judge speaking performances. (Report No. 2.) John C. Snidecor. OEMsr-830; Service Project No. N-109; OSRD No. 1823. The Psychological Corporation. August, 1943.

- M2** A study in training classification. Petty officers to select telephone talkers. (Report No. 3.) (n.a.) OEMsr-830; Service Project Nos. N-109 and SC-67; OSRD No. 1931. The Psychological Corporation. November, 1943.

- M3** A manual for the training of interviewers. (Memorandum No. 2.) John C. Snidecor and Grant Fairbanks. OEMsr-830; Service Project Nos. N-109 and SC-67; OSRD No. 1827. The Psychological Corporation. (n.d.)

218.4 Miscellaneous Voice Communication Problems

- M1** Installation and operation of equipment used in a basic voice communication course. (Memorandum No. 8.) (n.a.) OEMsr-830; Service Project Nos. N-109(1) and SC-67; OSRD No. 3749. The Psychological Corporation. June 7, 1944.

- M2** Microphone position [of the] T-30-S and T-17. (Report No. 11.) C. Horton Talley, James F. Curtis and C. Hess Haagen. OEMsr-830; Service Project No. SC-67; OSRD No. 4260. The Psychological Corporation. October 18, 1944.

- M3** Voice loudness over aircraft radios and microphones. (Report No. 10.) C. Horton Talley, James F. Curtis and others. OEMsr-830; Service Project No. SC-67; OSRD No. 4290. The Psychological Corporation. October 27, 1944.

- M4** A project for standardizing submarine phraseology and developing a training program in submarine voice communications. (Division 6. Report No. P57/R1421.) M. H. Abrams, William D. Neff and others. OEMsr-658, OEMsr-830 and OEMsr-1128; Service Project Nos. N-118 and N-109; OSRD No. 4795. Harvard University, The Psychological Corporation and Columbia University, New London Laboratory. February 28, 1945.

- M5** Voice communication courses. Appendix I, Voice communication for night fighter operation. (Memorandum No. 16.) Gayland L. Draeger and Foster C. Shoup. OEMsr-830; Service Project No. SC-67. The Psychological Corporation. July, 1945.

- M6** Voice communication courses. Appendix II, Courses for Far East Air Forces. Henry M. Moser and G. Paul Moore. OEMsr-830; Service Project No. SC-67. The Psychological Corporation. July, 1945.

220 Training in Special Fields

221 Gunnery

- M1** Developments in the use and construction of training aids for four-day course in 20-mm gunnery. (Project Memorandum No. 7.) Morris S. Viteles, Kinsley R. Smith and others. OEMsr-700; Service Project No. N-105; OSRD No. 1320. University of Pennsylvania. March 5, 1943.

- M2** Unit lesson plans for four-day course in 40-mm

gunnery. (Project Memorandum No. 8.) Morris S. Viteles, Kinsley R. Smith and others. OEMsr-700; Service Project No. N-105; OSRD No. 1781. University of Pennsylvania. September 1, 1943.

- M3** Memorandum on [the manual]: How to teach gunnery. A short course in effective teaching methods for gunnery instructors. (Memorandum No. 13.) Kinsley R. Smith, S. Medford Wesley and others. OEMsr-700; Service Project Nos. N-105 and NR-106; OSRD No. 3876. University of Pennsylvania. July 11, 1944.

- M4** Lesson plans for caliber .50 machine gun. (Memorandum No. 14.) O. Backstrom, Jr., John H. Gorsuch and Morris S. Viteles. OEMsr-700; Service Project No. N-105; OSRD No. 3909. University of Pennsylvania. July 19, 1944.

- M5** How to teach gunnery. A short course in effective teaching methods for gunnery instructors. (Revised edition.) (n.a.) OEMsr-700; Service Project No. NR-106. US Atlantic Fleet, Fleet Operational Training Command and University of Pennsylvania. October, 1944.

221.1 Tracking

- M1** Generality of tracking training. (Memorandum No. 9.) Guy E. Brown, Jr. OEMsr-581; Service Project No. SOS-6; OSRD No. 4508. Tufts College. December 28, 1944.

221.2 Sighting

- M1** Sighting methods of instruction used in naval aviation free gunnery. Final report on [the] activities of NDRC Project N-112. (Memorandum No. 1.) Morris S. Viteles and John H. Gorsuch. OEMsr-700; Service Project No. N-112. University of Pennsylvania. [September 21, 1944.]

222 Cargo Handling

- M1** Summary of work on the selection and training of cargo handling teams for combat-laden vessels. (Final Report No. 1.) Floyd L. Ruch. OEMsr-1372; Service Project No. N-116b; OSRD No. 5140. University of Southern California. May 29, 1945.

230 Fatigue Factors in Radar Operation

- M1** Radar operator fatigue. The effect of length and repetition of operating periods on efficiency of performance. (Research Report No. 6.) Donald B. Lindsley, Irving H. Anderson and others. OEMsr-919; Service Project Nos. SC-70 and NS-146; OSRD No. 3334. Yerkes Laboratories of Primate Biology and US Army Signal Corps, Southern Signal Corps School, Camp Murphy, Florida. January 4, 1944.

- M2** Concerning harmful effects of radar operation and fatigue. (Informal Memorandum No. 10.) Donald B. Lindsley. Service Project Nos. SC-70 and NS-146. [US Army Signal Corps, Southern Signal Corps School] Camp Murphy, Florida. February 29, 1944.

300 TESTS

310 Tests for Special Types of Personnel

311 Torpedomen and Gunner's Mates

M1 The development of achievement tests for gunner's mates schools. (Report No. 17.) Norman Frederiksen and A. E. Monroe. OEMsr-705; Service Project No. N-106; OSRD No. 5259. College Entrance Examination Board, Princeton, N. J. June 25, 1945.

M2 Development of achievement tests for Class A naval training schools [for] torpedomen. (Report No. 19.) Charles M. Harsh and Joseph B. Cooper. OEMsr-705; Service Project No. N-106; OSRD No. 5520. College Entrance Examination Board, Princeton, N. J. August 31, 1945.

312 Signalmen

M1 Achievement examination for Signalman School. (Report No. 18.) M. Duane Bown and Thelburn L. Engle. OEMsr-705; Service Project No. N-106; OSRD No. 5460. College Entrance Examination Board, Princeton, N. J. August 20, 1945.

313 Fire Control Equipment Operators

M1 Achievement examination questions and performance tests for operators of Navy fire control equipment. (Informal Memorandum No. 5.) W. J. Brogden. OEMsr-1171; Service Project No. N-114. University of Wisconsin. April 7, 1945.

314 Landing Craft Operators

M1 Development of achievement tests for the Landing Craft School, Coronado, California. (Report No. 21.) Norman Frederiksen. OEMsr-705; Service Project No. N-106; OSRD No. 5670. College Entrance Examination Board, Princeton, N. J. September 14, 1945.

315 Electricians

M1 The development of performance tests for use in Class A electrical schools. (Memorandum No. 17.) Merrell E. Thompson and Norman Frederiksen. OEMsr-705; Service Project No. N-106; OSRD No. 5666. College Entrance Examination Board, Princeton, N. J. September 13, 1945.

316 Distilling Plant Operators

M1 The construction and validation of a work readiness test for distilling plant operators. (Memorandum No. 19.) Bernard J. Covner, Harold A. Voss and S. Medford Wesley. [OEMsr-700;] Service Project No. NR-106; OSRD No. 5507. University of Pennsylvania. August 29, 1945.

317 Code Receivers

M1 The experimental edition of code receiving tests. (Report No. 1.) Albert K. Kurtz, Harold G. Seashore and others. OEMsr-830; Service Project No.

N-107; OSRD No. 1314. The Psychological Corporation. March 29, 1943.

M2 Instructor's manual for the code receiving tests. (n.a.) [OEMsr-830;] Service Project No. N-107. The Psychological Corporation. November, 1943.

M3 Tentative manual and guide for using the radio code test: Speed of Response, Form 1. (n.a.) [OEMsr-830;] Service Project No. N-107. The Psychological Corporation. December 15, 1943.

M4 The code receiving tests. (Memorandum No. 2.) Albert K. Kurtz and Harold G. Seashore. OEMsr-830; Service Project No. N-107; OSRD No. 3157. The Psychological Corporation. February 2, 1944.

M5 Graduation and rating test for Class A radio schools. (Memorandum No. 5.) Albert K. Kurtz and Harold G. Seashore. Service Project No. N-107. The Psychological Corporation. August 31, 1944.

M6 A test of two remedial devices in high-speed code reception. (Report No. 7.) Edward A. Jerome and Fred S. Keller. OEMsr-830; Service Project No. SC-88; OSRD No. 5365. The Psychological Corporation. July 23, 1945.

M7 Development of radio code receiving examinations. (Informal Memorandum No. 18.) M. Duane Bown and Harold O. Gulliksen. OEMsr-705; Service Project No. N-106. College Entrance Examination Board, Princeton, N. J. September 27, 1945.

318 Oscilloscope Operators

M1 Oscilloscope operator tests. (Memorandum No. 2.) Donald B. Lindsley. OEMsr-919; Service Project Nos. SC-70 and NS-146; OSRD No. 1812. Yerkes Laboratories of Primate Biology and US Army Signal Corps, Southern Signal Corps School, Camp Murphy, Florida. [September 1, 1943(?)]

M2 Instruction manual for oscilloscope operator tests. (Memorandum No. 3.) Donald B. Lindsley. OEMsr-919; Service Project Nos. SC-70 and NS-146; OSRD No. 1811. Yerkes Laboratories of Primate Biology and US Army Signal Corps, Southern Signal Corps School, Camp Murphy, Florida. [September 1, 1943(?)]

M3 Results from oscilloscope operator tests. (Memorandum No. 4.) Donald B. Lindsley. OEMsr-919; Service Project No. SC-70 and NS-146; OSRD No. 1813. Yerkes Laboratories of Primate Biology and US Army Signal Corps, Southern Signal Corps School, Camp Murphy, Florida. [September 1, 1943(?)]

M4 Effect of oscilloscope operation on vision. (Research Report No. 4.) Donald B. Lindsley, Irving H. Anderson and others. OEMsr-919; Service Project Nos. SC-70 and NS-146; OSRD No. 2051. Yerkes Laboratories of Primate Biology and US Army Signal Corps, Southern Signal Corps School, Camp Murphy, Florida. November 15, 1943.

M5 Vision as related to proficiency in oscilloscope operation. (Research Report No. 8.) Donald B. Lindsley, Irving H. Anderson and others. OEMsr-

919; Service Project Nos. SC-70 and NS-146; OSRD No. 3409. Yerkes Laboratories of Primate Biology and US Army Signal Corps, Southern Signal Corps School, Camp Murphy, Florida. February 24, 1944.

- M6** A validation study of oscilloscope operator tests. (Research Report No. 10.) Donald B. Lindsley and Irving H. Anderson. OEMsr-919; Service Project Nos. SC-70 and NS-146; OSRD No. 3712. Yerkes Laboratories of Primate Biology and US Army Signal Corps, Southern Signal Corps School, Camp Murphy, Florida. April 24, 1944.

- M7** The effect of extraneous illumination upon detection of signals on an A-scan oscilloscope. (Research Report No. 13.) Irving H. Anderson, Alfred L. Baldwin and others. OEMsr-919; Service Project Nos. SC-70 and NS-146; OSRD No. 4264. Yerkes Laboratories of Primate Biology. October 18, 1944.

318.1 Air-to-Surface Vessel Radar Equipment Operators

- M1** Proficiency measures for classification and assignment of operators of air-to-surface vessel radar equipment. (Memorandum No. 5.) Donald B. Lindsley. OEMsr-919; Service Project Nos. SC-70 and NS-146; OSRD No. 2012. Yerkes Laboratories of Primate Biology and US Army Signal Corps, Southern Signal Corps School, Camp Murphy, Florida. September 29, 1943.

- M2** Development of proficiency measures for classification and assignment of operators of air-to-surface vessel radar equipment. (Research Report No. 2.) Donald B. Lindsley. OEMsr-919; Service Project Nos. SC-70 and NS-146; OSRD No. 2013. Yerkes Laboratories of Primate Biology and US Army Signal Corps, Southern Signal Corps School, Camp Murphy, Florida. September 29, 1943.

- M3** Visual status of air-to-surface vessel radar operators. (Research Report No. 9.) Irving H. Anderson, Charles S. Bridgman and others. OEMsr-919; Service Project Nos. SC-70 and NS-146; OSRD No. 3443-B. Yerkes Laboratories of Primate Biology and US Army Signal Corps, Southern Signal Corps School, Camp Murphy, Florida. March 20, 1944.

319 Officer Qualification

- M1** Preparation of a preliminary form of an Officer's Selection Test. Harold O. Gulliksen. OEMsr-705; Service Project No. N-106. College Entrance Examination Board, Princeton, N. J. December 11, 1942.

- M2** Preparation of the United States Navy Officer Qualification Test, Form 1. (Report No. 3.) (n.a.) OEMsr-705; Service Project No. N-106; OSRD No. 1273. College Entrance Examination Board, Princeton, N. J. March 12, 1943.

- M3** Preparation of norms for the Officer Qualification Test, Form 1. (Memorandum No. 4.) Norman Frederiksen. OEMsr-705; Service Project No. N-106. College Entrance Examination Board, Princeton, N. J. May 28, 1943.

- M4** Preparation of norms for women for the Officer Qualification Test, Form 1. (Memorandum No. 9.) (n.a.) OEMsr-705; Service Project No. N-106. College Entrance Examination Board, Princeton, N. J. July 24, 1943.

- M5** Development and validity of the United States Navy Officer Qualification Test. (Report No. 6.) Norman Frederiksen and D. A. Peterson. OEMsr-705; Service Project No. N-106; OSRD No. 3186. College Entrance Examination Board, Princeton, N. J. January 7, 1944.

- M6** A statistical evaluation of the United States Navy Officer Qualification Test, Forms 2 and 3. (Report No. 10.) D. A. Peterson. OEMsr-705; Service Project No. N-106; OSRD No. 3978. College Entrance Examination Board, Princeton, N. J. August 4, 1944.

320 Special Tests

321 Personal Inventory

- M1** Standardization and validation of the Personal Inventory. Psychiatric criterion. (Project Report No. 1.) Walter C. Shipley, Florence E. Gray and Nancy Newbert. OEMsr-834; OSRD No. 1606. Brown University. June 24, 1943.

- M2** The analysis of a Personal Inventory and other tests. (Memorandum No. 1.) Clarence H. Graham. [OEMsr-834;] Service Project No. N-113. [Brown University.] March 14, 1944.

- M3** The Personal Inventory, short form, Format C. Derivation and preliminary psychiatric validation. (Report No. 5.) Walter C. Shipley, Florence E. Gray and Nancy Newbert. OEMsr-834; Service Project No. N-113; OSRD No. 3390. Brown University. March 15, 1944.

- M4** The comparability of Formats A and B of the Personal Inventory. (Report No. 6.) Richard N. Berry, H. J. Leavitt and F. A. Mote. OEMsr-834; Service Project No. N-113; OSRD No. 3582. Brown University. April 21, 1944.

- M5** The Personal Inventory, short form, Format C. Psychiatric validation on a pre-testing basis. (Report No. 7.) Walter C. Shipley, Florence E. Gray and Nancy Newbert. OEMsr-834; Service Project No. N-113; OSRD No. 3604. Brown University. May 1, 1944.

- M6** A comparison of Personal Inventory scores with service records, one year after testing. (Report No. 8.) Walter C. Shipley, Florence E. Gray and Nancy Newbert. OEMsr-834; Service Project No. N-113; OSRD No. 3755. Brown University. June 10, 1944.

- M7** Results from the long and short forms of the Personal Inventory and the General Classification Test. (Report No. 9.) Richard N. Berry, Clarence H. Graham and F. A. Mote. OEMsr-834; Service Project No. N-113; OSRD No. 3962. Brown University. July 31, 1944.

- M8** Summary of research on the Personal Inventory and other tests. (Report No. 10.) Walter C. Shipley and Clarence H. Graham. OEMsr-834; Service Project No. N-113; OSRD No. 3963. Brown University. August 1, 1944.
- M9** An evaluation of the Personal Inventory for predicting success in parachute school. (Report No. 16.) G. A. Satter. OEMsr-705; Service Project No. N-106; OSRD No. 4870. College Entrance Examination Board, Princeton, N. J. March 28, 1945.
- M10** An evaluation of the Personal Inventory and certain other measures in the prediction of submarine officers' evaluations of enlisted men. (Report No. 22.) G. A. Satter. OEMsr-705; Service Project No. N-106; OSRD No. 5557. College Entrance Examination Board, Princeton, N. J. September 7, 1945.
- 322 Aptitude Tests**
- M1** Naval aptitude tests. (Report No. 1.) (n.a.) OEMsr-705; Service Project No. N-106; OSRD No. 1127. College Entrance Examination Board, Princeton, N. J. December 10, 1942.
- M2** Averages, standard deviations and intercorrelations of Navy aptitude tests. (Report No. 4.) Harold O. Gulliksen, Herbert S. Conrad and Norman Frederiksen. OEMsr-705; Service Project No. N-106; OSRD No. 1536. College Entrance Examination Board, Princeton, N. J. June 7, 1943.
- M3** Item analysis of Navy aptitude tests. (Report No. 5.) Herbert S. Conrad. OEMsr-705; Service Project No. N-106; OSRD No. 3039. College Entrance Examination Board, Princeton, N. J. December 30, 1943.
- M4** Validity of Navy aptitude tests in service schools at the Great Lakes Naval Training Station. (Report No. 7.) Norman Frederiksen. OEMsr-705; Service Project No. N-106; OSRD No. 3245. College Entrance Examination Board, Princeton, N. J. January 31, 1944.
- M5** Validity of an experimental battery of aptitude tests at the Ordnance and Gunnery Schools, Washington Navy Yard. (Report No. 8.) Norman Frederiksen. OEMsr-705; Service Project No. N-106; OSRD No. 3619. College Entrance Examination Board, Princeton, N. J. April 29, 1944.
- M6** Summary report on research and development of the Navy's aptitude testing program. Final report on Contract OEMsr-705 [covering period from] September 1, 1942 to October 31, 1945. (Report No. 24.) Herbert S. Conrad. OEMsr-705; Service Project No. N-106; OSRD No. 6110. College Entrance Examination Board, Princeton, N. J. October 31, 1945.
- 323 Spatial Relation Tests**
- M1** Preparation of an experimental form of a spatial relation test. (Memorandum No. 3.) Norman Frederiksen. OEMsr-705; Service Project No. N-106. College Entrance Examination Board, Princeton, N. J. May 27, 1943.
- 324 New London-NDRC Questionnaire**
- M1** Results obtained from testing recruits with the New London-NDRC Questionnaire at the Newport Naval Training Station. (Report No. 2.) F. A. Mote, Richard N. Berry and Clarence H. Graham. OEMsr-834; Service Project No. N-113; OSRD No. 3040. Brown University. December 6, 1943.
- 325 Mechanical Knowledge Tests**
- M1** Suggestions for the revision of the United States Navy Mechanical Aptitude Test, Form T. (Memorandum No. 2.) Harold O. Gulliksen. OEMsr-705; Service Project No. N-106. College Entrance Examination Board, Princeton, N. J. January 18, 1943.
- M2** Selection of test items by correlation with an external criterion, as applied to the Mechanical Comprehension Test, OQT-O-2. (Memorandum No. 12.) Harold O. Gulliksen. OEMsr-705; Service Project No. N-106; OSRD No. 3187. College Entrance Examination Board, Princeton, N. J. January 8, 1944.
- M3** Statistical analysis of the Mechanical Knowledge Test. (Memorandum No. 13.) Herbert S. Conrad. OEMsr-705; Service Project No. N-106; OSRD No. 3246. College Entrance Examination Board, Princeton, N. J. January 28, 1944.
- 326 Screen Interpretation Test**
- M1** Development of the Screen Interpretation Test for airborne radar equipment. (Research Report No. 12.) Irving H. Anderson, Alfred L. Baldwin and others. OEMsr-919; Service Project Nos. SC-70 and NS-146; OSRD No. 3897. Yerkes Laboratories of Primate Biology. July 15, 1944.
- 327 US Navy General Classification Test**
- M1** Preparation of the United States Navy General Classification Test, Form 1, and the United States Navy Tests of Reading and Arithmetical Reasoning, Form 1. (Memorandum No. 7.) Norman Frederiksen. OEMsr-705; Service Project No. N-106. College Entrance Examination Board, Princeton, N. J. June 23, 1943.
- 328 Miscellaneous Special Tests**
- M1** Constructing work readiness tests. (Memorandum No. 22.) Harold A. Voss and S. Medford Wesley. [OEMsr-700;] Service Project No. NR-106; OSRD No. 5521. University of Pennsylvania. August 31, 1945.
- 400 GRADING AND SCORING SYSTEMS**
- 410 Grades and Examinations**

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411 Evaluation and Validation of Tests

- M1** Analysis of the NROTC selective examination, Form C, and suggestions for its revision. (Report No. 2.) (n.a.) OEMsr-705; Service Project No. N-106; OSRD No. 1290. College Entrance Examination Board, Princeton, N. J. February 15, 1943.
- M2** The construction and validation of an Arithmetical Computation Test. (Report No. 13.) G. A. Satter and Norman Frederiksen. OEMsr-705; Service Project No. N-106; OSRD No. 4556. College Entrance Examination Board, Princeton, N. J. January 8, 1945.
- M3** A statistical evaluation of the Basic Classification Test Battery, Form 1. (Report No. 14.) Herbert S. Conrad. OEMsr-705; Service Project No. N-106; OSRD No. 4636. College Entrance Examination Board, Princeton, N. J. May 14, 1945.
- M4** A further study of the validity of the Arithmetical Computation Test. (Memorandum No. 15.) Norman Frederiksen. OEMsr-705; Service Project No. N-106; OSRD No. 5302. College Entrance Examination Board, Princeton, N. J. July 3, 1945.

412 Item Analysis

- M1** Factor analysis of the new United States Navy Basic Classification Test Battery. (Memorandum No. 10.) D. A. Peterson. OEMsr-705; Service Project No. N-106; OSRD No. 3004. College Entrance Examination Board, Princeton, N. J. September 29, 1943.
- M2** Item analysis and evaluation of the scoring stencil of the Personal Inventory. (Report No. 4.) Walter C. Shipley, Florence E. Gray and Nancy Newbert. OEMsr-834; Service Project No. N-113; OSRD No. 3315. Brown University. February 14, 1944.
- M3** Selection of items for the US Navy General Classification Test, Form 2, and the US Navy Tests of Reading and Arithmetical Reasoning, Form 2. (Report No. 9.) G. A. Satter. OEMsr-705; Service Project No. N-106; OSRD No. 3756. College Entrance Examination Board, Princeton, N. J. June 8, 1944.
- M4** Characteristics and uses of item-analysis data. (Report No. 11.) Herbert S. Conrad. OEMsr-705; Service Project No. N-106; OSRD No. 4034. College Entrance Examination Board, Princeton, N. J. August 19, 1944.
- M5** Item differentiation and derivation of a 50-item scoring key for the Officer Personal Inventory, Form 1. (Memorandum No. 4.) Kinsley R. Smith and Harold A. Voss. OEMsr-1298; Service Project No. N-117. [Pennsylvania State College.] February 8, 1945.

413 Scores and Grades

- M1** Service school grades. (Memorandum No. 11.) Harold O. Gulliksen. OEMsr-705; Service Project No. N-106; OSRD No. 3177. College Entrance

Examination Board, Princeton, N. J. January 6, 1944.

- M2** The relation of selection test scores to tank escape performance [at the] Submarine School. (Report No. 3.) Clarence H. Graham, F. A. Mote and Richard N. Berry. OEMsr-834; Service Project No. N-113; OSRD No. 3262. Brown University. January 31, 1944.

414 Norms

- M1** The preparation of norms for the fleet edition of the General Classification Test. (Report No. 12.) D. A. Peterson. OEMsr-705; Service Project No. N-106; OSRD No. 4242-B. College Entrance Examination Board, Princeton, N. J. October 10, 1944.

420 Factors Affecting Success

- M1** Predicting success in service school from the order of assignments. (Report No. 20.) G. A. Satter and Herbert S. Conrad. OEMsr-705; Service Project No. N-106; OSRD No. 5556. College Entrance Examination Board, Princeton, N. J. September 7, 1945.
- M2** Use of test scores and quality-classification ratings in predicting success in Electrician's Mates School. (Report No. 23.) Herbert S. Conrad and G. A. Satter. OEMsr-705; Service Project No. N-106; OSRD No. 5667. College Entrance Examination Board, Princeton, N. J. September 13, 1945.

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- M2** Comments on [the] manual entitled: Handbook of interviewing guides for destroyer (2,200-ton) billets. Repair party, engine room, fire room. . . . (Memorandum No. 11.) Morris S. Viteles and John H. Gorsuch. OEMsr-700; Service Project No. NR-106. [University of Pennsylvania.] May 14, 1945.
- M3** Handbook of interviewing guides for billets on 2,200-ton destroyer. Ship control, combat information, communication, damage control, engineering [and] gunnery. (First Edition.) H. D. Clarke. OEMsr-700; Service Project No. NR-106. US At-

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- M2** [Memorandum on:] The achievement testing program in the US Naval Amphibious Training Bases [and] the manual: Measuring the achievement of the trainee. (Memorandum No. 2.) Kinsley R. Smith and Harold A. Voss. OEMsr-1298; Service Project No. N-117. [Pennsylvania State College.] October 19, 1944.
- M3** [Memorandum on:] Training manual [of the] United States Atlantic Fleet, Amphibious Training Command. (Memorandum No. 3.) Kinsley R. Smith and Harold A. Voss. OEMsr-1298; Service Project No. N-117. [Pennsylvania State College.] January 2, 1945.
- M4** Analysis of responses of Amphibious Force personnel to the: Questionnaire for personnel returning from combat zones. (Memorandum No. 5.) Kinsley R. Smith and Harold A. Voss. OEMsr-1298; Service Project No. N-117. [Pennsylvania State College.] March 15, 1945.
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- M7** The effectiveness of classification data in predicting billet performance in training in the Amphibious Force. (Report No. 1.) Kinsley R. Smith, Harold A. Voss and others. OEMsr-1298; Service Project No. N-117; OSRD No. 5198. Pennsylvania State College. June 12, 1945.
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- M2** An activity-preference test for the classification of service personnel. Final report of Project SOS-7. Truman L. Kelley. OEMsr-1213; Service Project No. SOS-7; OSRD No. 4484. Harvard University. December 21, 1944.
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- M2** Suggestions for three series of target films for gunnery trainer, Mark 3. (Informal Memorandum No. 22.) Morris S. Viteles and John H. Gorsuch. OEMsr-700; Service Project No. N-105. University of Pennsylvania. July 19, 1945.
- M3** The development of the remote control aerial gunnery trainer. (Informal Memorandum No. 12.) Karl U. Smith and William C. H. Prentice. OEMsr-1171; Service Project No. AC-94. University of Wisconsin. September 10, 1945.
- M4** Design and construction of an airborne synthetic gunnery trainer and test device for director-type computing sights. (Memorandum No. 4.) D. G. Ellson. OEMsr-1171; Service Project No. AC-94; OSRD No. 5938. University of Wisconsin. September 26, 1945.
- M5** Knowledge of results as it affects framing accuracy in a modified E-14 trainer with the B-29 pedestal sight. (Report No. 8.) Charles S. Bridgman, J. E. P. Libby and R. L. Solomon. OEMsr-1171; Service Project No. AC-94; OSRD No. 6050. University of Wisconsin. October 5, 1945.
- M6** A remotely controlled test, RCT, device for the analysis of gunner performance on flexible gunnery equipment. (Memorandum No. 5.) Carl H. Wedell. OEMsr-1171; Service Project No. AC-94; OSRD No. 6083. University of Wisconsin. October 12, 1945.
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- M9** The operation of the 5-inch/38 twin mount. (Memorandum No. 32.) Morris S. Viteles and John H. Gorsuch. OEMsr-700; Service Project No. N-105. [University of Pennsylvania.] October 29, 1945.

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- M1** The construction and use of a fire control problem solution indicator. (Memorandum No. 10.) D. G. Ellson. OEMsr-1171; Service Project No. N-114; OSRD No. 4381. University of Wisconsin. November 27, 1944.
- M2** Operating instructions for use of the gun fire control system, Mark 57. (Preliminary edition.) (n.a.)

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- M3** Lesson plans for a course of instruction in the operation of the gun fire control system, Mark 63. (Preliminary edition.) (n.a.) [OEMsr-815; Service Project No. N-111.] [Brown University.] February 17, 1945.
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- M5** Lesson plans for a course of instruction in the operation of the gun fire control system, Mark 57. (n.a.) [OEMsr-815; Service Project No. N-111.] [Brown University.] April 30, 1945.
- M6** Achievement examination questions and performance tests for use in courses of instruction in the operation of the gun fire control systems, Mark 52, Mark 57 and Mark 63. (Informal Memorandum No. 10.) William E. Kappauf and Clarence H. Graham. OEMsr-815; Service Project No. N-111. Brown University [and Advanced Fire Control School, Navy Yard, Washington, D. C.] June 20, 1945.
- M7** Preparation of the manual entitled: Operating instructions for use of the gun fire control system, Mark 57. (Informal Memorandum No. 13.) William E. Kappauf. OEMsr-815; Service Project No. N-111. Brown University. September 4, 1945.
- M8** Preparation of the manual entitled: Operating instructions [for the] gun fire control system, Mark 63. (Informal Memorandum No. 14.) William E. Kappauf. OEMsr-815; Service Project No. N-111. Brown University. September 4, 1945.

611.1 Sights and Sighting

- M1** Need for a check sight on the Mark 15 gunsight and on all sights of a similar nature. (Memorandum No. 1.) William E. Kappauf. Service Project No. N-111. [Brown University.] January 17, 1944.
- M2** [Gunsighting symbols and definitions.] Revision of [Report No.] OD-3447. (Memorandum No. 3.) Henry P. Birmingham and William E. Kappauf. Service Project No. N-111. [Brown University.] May 3, 1944.
- M3** Observations while training gun pointers in the use of the T-10 drive control on a 40-mm gun. (Informal Memorandum No. 1.) William C. Biel and Leonard C. Mead. [OEMsr-581; Service Project No. SOS-6.] [Tufts College.] June 21, 1944.
- M4** A comparison of performance on reading American and German aiming circles. (Informal Memorandum No. 4.) John P. Nafe. [OEMsr-581; Service Project No. SOS-11.] [Tufts College.] January 10, 1945.
- M5** Graphical analysis of triggering reactions on B-29 sights. (Report No. 2.) J. K. Adams. OEMsr-1171;

Service Project No. AC-94; OSRD No. 4864. University of Wisconsin. March 27, 1945.

- M6** A comparative test of reticle patterns for the gun-sight, Mark 15. (Report No. 3.) Henry P. Birmingham, Thomas G. Hermans and others. OEMsr-815; Service Project No. N-111; OSRD No. 4878. Brown University. March 30, 1945.
- M7** Design and development of a B-29 ground trainer and test devices. (Informal Memorandum No. 3.) Karl U. Smith. OEMsr-1171; Service Project No. AC-94. University of Wisconsin. May 30, 1945.
- M8** A graphical analysis of sighting performance on B-29 sights. (Report No. 4.) Charles S. Bridgman, Florence E. Gray and R. L. Solomon. OEMsr-1171; Service Project No. AC-94; OSRD No. 5221. University of Wisconsin. June 19, 1945.
- M9** Psychological factors in operation and design of field artillery, tank destroyer and tank sighting equipment. (Final Report No. 6.) Richard N. Berry, Robert H. Brown and others. OEMsr-581; Service Project No. SOS-11; OSRD No. 5342. Tufts College. July 16, 1945.
- M10** Comparison of variability of computer azimuth correction obtained with a standard General Electric pedestal sight and a viscously damped sight. (Informal Memorandum No. 11.) J. K. Adams, D. G. Ellson and Florence E. Gray. OEMsr-1171; Service Project No. AC-94. University of Wisconsin. August 20, 1945.
- M11** An experimental study of the efficiency of sighting performance with modified sight controls as compared to that with standard sight controls on the B-29 pedestal sight. (Report No. 7.) D. C. Beier and William C. H. Prentice. OEMsr-1171; Service Project No. AC-94; OSRD No. 5558. University of Wisconsin. September 10, 1945.
- M12** Elementary theory of lead-computing gunsights and directors. (Informal Memorandum No. 15.) William E. Kappauf. OEMsr-815; Service Project No. N-111. Brown University. September 15, 1945.
- M13** A comparison of three speed-ring methods and the computing sight M-7 in accuracy of fire control on the 40-mm gun. (Report No. 14.) John H. Rappaplie and William C. Biel. OEMsr-581; Service Project No. SOS-6; OSRD No. 5762. Tufts College. September 21, 1945.
- M14** Summary of research on psychological problems in the operation of antiaircraft lead-computing sights and directors. Final report of Contract OEMsr-815. (Report No. 5.) William E. Kappauf. Service Project No. N-111; OSRD No. 5425. Brown University. September 29, 1945.

611.11 Computers

- M1** A check sight for observing gun pointing with the computing sight, M-7. Its reliability and validity. (Memorandum No. 6.) William C. Biel, Guy E. Brown, Jr. and others. OEMsr-581; Service Project

No. SOS-6; OSRD No. 4003. Tufts College. August 11, 1944.

- M2** The effectiveness of a check sight technique for training 40-mm gun pointers who are using the computing sight, M-7. (Memorandum No. 7.) William C. Biel, Guy E. Brown, Jr. and others. OEMsr-581; Service Project No. SOS-6; OSRD No. 4054. Tufts College. August 22, 1944.
- M3** An evaluation of a frequently used technique for appraising tracking on the 40-mm gun equipped with the computing sight, M-7. (Memorandum No. 13.) John H. Rappaplie. OEMsr-581; Service Project No. SOS-6; OSRD No. 4976. Tufts College. April 23, 1945.
- M4** Evaluation of a plexiglas check sight as a testing and training aid with gun pointers on a 40-mm gun equipped with the computing sight, M-7. (Memorandum No. 14.) Guy E. Brown, Jr. OEMsr-581; Service Project No. SOS-6; OSRD No. 4977. Tufts College. April 23, 1945.
- M5** The relative effectiveness of a check sight technique compared with two other methods used in training gun pointers on the 40-mm gun equipped with the computing sight, M-7. (Memorandum No. 12.) John H. Rappaplie. OEMsr-581; Service Project No. SOS-6; OSRD No. 4975. Tufts College. April 25, 1945.
- M6** A sight computer test apparatus for study of rate tracking. (Memorandum No. 2.) D. G. Ellson. OEMsr-1171; Service Project No. AC-94; OSRD No. 5735. University of Wisconsin. September 19, 1945.

611.12 Panoramic Telescopes

- M1** The effectiveness of a warning mark on the scale of the M-12 panoramic sight on 100-mil errors. (Memorandum No. 1.) Richard N. Berry, Robert H. Brown and others. OEMsr-581; Service Project No. SOS-11; OSRD No. 4265. Tufts College. October 18, 1944.
- M2** The development of a counter or odometer-type scale to replace the micrometer scale of the panoramic telescope, M-12. (Memorandum No. 2.) Lorrin A. Riggs. OEMsr-581; Service Project No. SOS-11; OSRD No. 4390. Tufts College. November 28, 1944.
- M3** Test model of panoramic telescope M-12 (T-138). (Informal Memorandum No. 5.) John P. Nafe. OEMsr-581; Service Project No. SOS-11. Tufts College. April 2, 1945.
- M4** Gross errors in reading scales of panoramic telescopes. (Report No. 1.) Richard N. Berry, Robert H. Brown and others. OEMsr-581; Service Project No. SOS-11; OSRD No. 4934. Tufts College. April 13, 1945.
- M5** A study of gunnery errors made with different panoramic telescopes on Bishop trainers. (Report No. 2.) Richard N. Berry, Leonard C. Mead and others. OEMsr-581; Service Project No. SOS-11; OSRD No. 4935. Tufts College. April 13, 1945.

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- M6** Errors in reading scales and changing deflections of panoramic telescopes. (Report No. 4.) Richard N. Berry, Robert H. Brown and others. OEMsr-581; Service Project No. SOS-11; OSRD No. 5070. Tufts College. May 18, 1945.
- M7** Errors in setting deflections on panoramic telescopes. (Report No. 3.) Richard N. Berry, Robert H. Brown and others. OEMsr-581; Service Project No. SOS-11; OSRD No. 5071. Tufts College. May 18, 1945.
- 611.2 Tracking**
- M1** An instrument for tracking training. (Project Memorandum No. 6.) William E. Kappauf and F. A. Mote. OEMsr-815; OSRD No. 1497. Brown University. May 4, 1943.
- M2** A study of the Foxboro trainer as a training device for learning to track by means of pip-matching. (Research Report No. 5.) (n.a.) OEMsr-919; Service Project Nos. SC-70 and NS-146; OSRD No. 3102. Yerkes Laboratories of Primate Biology and US Army Signal Corps, Southern Signal Corps School, Camp Murphy, Florida. December 16, 1943.
- M3** Recommendations for the use of the Foxboro trainer, BC-968. (Memorandum No. 6.) (n.a.) OEMsr-919; Service Project Nos. SC-70 and NS-146; OSRD No. 3103. Yerkes Laboratories of Primate Biology and US Army Signal Corps, Southern Signal Corps School, Camp Murphy, Florida. December 16, 1943.
- M4** Description of the Tufts tracking trainer. (Report No. 11.) Bradford B. Hudson and Lloyd V. Searle. OEMsr-581; Service Project No. SOS-6; OSRD No. 3286. Tufts College. February 5, 1944.
- M5** A study of the SCR-584 basic trainer as a training device for learning range tracking. (Research Report No. 7.) (n.a.) OEMsr-919; Service Project Nos. SC-70 and NS-146; OSRD No. 3344. Yerkes Laboratories of Primate Biology and US Army Signal Corps, Southern Signal Corps School, Camp Murphy, Florida. February 10, 1944.
- M6** A variable-speed assembly for the azimuth hand-wheel drive of the 40-mm gun. (Memorandum No. 4.) J. G. Beebe-Center. [OEMsr-581;] Service Project No. SOS-6. [Tufts College.] March 1, 1944.
- M7** A study of the Tufts tracking trainer as a selection and training device for trackers on the director, M-7. (Report No. 12.) William C. Biel and Lloyd V. Searle. OEMsr-581; Service Project No. SOS-6; OSRD No. 3606. Tufts College. April 24, 1944.
- M8** Comparison of range tracking methods. Tracking to a fixed hairline versus tracking to a rotating hairline. (Research Report No. 11.) Irving H. Anderson, Alfred L. Baldwin and others. OEMsr-919; Service Project Nos. SC-70 and NS-146; OSRD No. 3858. Yerkes Laboratories of Primate Biology. July 4, 1944.
- M9** A study of the tracking proficiency of student operators during training on aerial tracking of the Mark 37 gun director with Mark 4 radar. (Report No. 10.) S. D. S. Spragg. OEMsr-1171; Service Project No. N-114; OSRD No. 4049. University of Wisconsin. August 22, 1944.
- M10** A study in errors of prediction resulting from azimuth tracking errors on the director, M-7. (Memorandum No. 10.) Alex L. Sweet. OEMsr-581; Service Project No. SOS-6; OSRD No. 4509. Tufts College. December 28, 1944.
- M11** Tracking with the gunsight, Mark 15. Data on tracking accuracy and learning. (Report No. 2.) Henry P. Birmingham, Thomas G. Hermans and others. OEMsr-815; Service Project No. N-111; OSRD No. 4547. Brown University. January 6, 1945.
- M12** A comparison of two non-timing methods for scoring on-target tracking on the 40-mm gun equipped with the computing sight, M-7. (Memorandum No. 11.) John H. Rappalie. OEMsr-581; Service Project No. SOS-6; OSRD No. 4647. Tufts College. January 29, 1945.
- M13** Analysis of triggering on remote control sights and its relation to accuracy in tracking and framing. (Report No. 1.) J. K. Adams. OEMsr-1171; Service Project No. AC-94; OSRD No. 4863. University of Wisconsin. March 27, 1945.
- M14** An investigation of the relative accuracy of five methods of tracking aerial targets using Mark 12 radar. (Report No. 20.) D. C. Beier and H. A. Taylor. OEMsr-1171; Service Project No. N-114; OSRD No. 4927. University of Wisconsin. April 16, 1945.
- M15** Retention of on-target tracking skill on the 40-mm gun following a training experiment. (Memorandum No. 15.) Guy E. Brown, Jr. OEMsr-581; Service Project No. SOS-6; OSRD No. 4978. Tufts College. April 24, 1945.
- M16** A mechanical trainer simulating tracking with the Mark 12 radar spot presentation. Description and learning curve. (Informal Memorandum No. 4.) W. J. Brogden. OEMsr-1171; Service Project No. N-114. University of Wisconsin. May 8, 1945.
- M17** The design of phototube scoring devices for tracking trainers. (Informal Memorandum No. 9.) William E. Kappauf. OEMsr-815; Service Project No. N-111. Brown University. May 23, 1945.
- M18** Supplementary data on the validity of a non-timing method for scoring on-target tracking on the 40-mm gun equipped with the computing sight, M-7. (Memorandum No. 17.) John H. Rappalie. OEMsr-581; Service Project No. SOS-6; OSRD No. 5219. Tufts College. June 18, 1945.
- M19** A photographic determination of the accuracy of measures of optical and radar tracking error in the gun director, Mark 37, by an optical check-scope method. (Memorandum No. 11.) D. C. Beier, D. G. Ellson and H. A. Taylor. OEMsr-1171; Service Project No. N-114; OSRD No. 5223. University of Wisconsin. June 19, 1945.
- M20** Description of a radar air-search tracking trainer.

(Informal Memorandum No. 24.) Donald B. Lindsley. OEMsr-919; Service Project Nos. SC-70 and NS-146. Yerkes Laboratories of Primate Biology and US Army Air Forces, Boca Raton Field, Florida. August 22, 1945.

- M21** A new type mechanical plan position indicating tracking trainer. (Informal Memorandum No. 26.) Donald B. Lindsley. OEMsr-919; Service Project Nos. SC-70 and NS-146. Yerkes Laboratories of Primate Biology and US Army Air Forces, Boca Raton Field, Florida. September 4, 1945.
- M22** Variability of B-29 computer output. Mechanical tracking using constant azimuth rates. (Report No. 5.) J. K. Adams, D. G. Ellson and Florence E. Gray. OEMsr-1171; Service Project No. AC-94; OSRD No. 5637. University of Wisconsin. September 10, 1945.
- M23** A study of rate tracking by gunners on the B-29 pedestal sight. (Report No. 6.) J. K. Adams, D. G. Ellson and Florence E. Gray. OEMsr-1171; Service Project No. AC-94; OSRD No. 5638. University of Wisconsin. September 10, 1945.
- M24** The construction and operation of a blind tracking demonstrator for the gun fire control systems, Mark 57, Mark 60 and Mark 63. (Informal Memorandum No. 17.) Franklin V. Taylor. OEMsr-815; Service Project No. N-111. Brown University and Advanced Fire Control School, Navy Yard, Washington, D. C. September 14, 1945.
- M25** The development of a device to indicate the accuracy of on-target tracking of aerial targets. (Report No. 6.) J. D. Coakley. OEMsr-614; Service Project No. N-111; OSRD No. 5737. National Academy of Sciences. September 17, 1945.
- M26** Studies with the variable-drive T-18 for 40-mm gun carriage, M-2-A1. (Report No. 13.) William C. Biel, Guy E. Brown, Jr. and William J. Griffiths. OEMsr-581; Service Project No. SOS-6; OSRD No. 5736. Tufts College. September 19, 1945.
- M27** A study of tracking on directors M-5-A2 and M-5-A2E1. (Report No. 15.) Robert M. Gottsdanker and William C. Biel. OEMsr-581; Service Project No. SOS-6; OSRD No. 5929. Tufts College. September 25, 1945.
- M28** A camera for recording tracking performance with the gunsight, Mark 14. (Memorandum No. 34.) A. G. Bayroff, John H. Gorsuch and others. OEMsr-700; Service Project No. N-105; OSRD No. 6230. University of Pennsylvania. October 30, 1945.

611.3 Directors

- M1** Operating instructions [for the] gun director Mark 51, Model 3, controlling heavy antiaircraft batteries. (n.a.) [OEMsr-815; Service Project No. N-111.] US Fleet, Headquarters of the Commander-in-Chief [and Brown University]. July, 1944.
- M2** Preparation of the manual entitled: Operating instructions [for the] gun director Mark 51, Model 3,

controlling heavy antiaircraft batteries. (Memorandum No. 5.) William E. Kappauf. [OEMsr-815;] Service Project No. N-111. [Brown University.] October 30, 1944.

- M3** Review of the project's comments on the operating characteristics of the gun directors, Mark 51 and Mark 52, and its suggestions for the improvement in the design of these directors. (Memorandum No. 6.) William E. Kappauf. [OEMsr-815;] Service Project No. N-111. Advanced Fire Control School, Navy Yard, Washington, D. C. [and Brown University]. November 10, 1944.
- M4** Design, construction and validation of a training instrument for optical pointing and training in the gun director, Mark 37. (Report No. 14.) D. G. Ellson. OEMsr-1171; Service Project No. N-114; OSRD No. 4474. University of Wisconsin. December 18, 1944.
- M5** Operating instructions for the gun director, Mark 52. (COMINCH Report No. P-6.) (n.a.) [OEMsr-815;] Service Project No. N-111. US Fleet, Headquarters of the Commander-in-Chief [and Brown University]. January, 1945.
- M6** Preparation of the manual entitled: Operating instructions for the gun director, Mark 52. (Informal Memorandum No. 8.) William E. Kappauf. OEMsr-815; Service Project No. N-111. Brown University and Advanced Fire Control School, Navy Yard, Washington, D. C. May 18, 1945.
- M7** A second summary of project comments on director operating characteristics and design. (Informal Memorandum No. 11.) William E. Kappauf. OEMsr-815; Service Project No. N-111. Brown University and Advanced Fire Control School, Navy Yard, Washington, D. C. July 26, 1945.
- M8** The design of a tracking head for use on pedestal-type directors. (Informal Memorandum No. 18.) William E. Kappauf. OEMsr-815; Service Project No. N-111. Brown University and Advanced Fire Control School, Navy Yard, Washington, D. C. September 18, 1945.

611.4 Trial Fire and Burst Control

- M1** Polaroid spotting trainer. (Memorandum No. 4.) William E. Kappauf. [OEMsr-815;] Service Project No. N-111. Advanced Fire Control School, Navy Yard, Washington, D. C. [and Brown University]. June 5, 1944.
- M2** An automatic burst-control device for aerial gunnery. (Memorandum No. 1.) J. K. Adams, J. E. P. Libby and R. L. Solomon. OEMsr-1171; Service Project No. AC-94; OSRD No. 5185. University of Wisconsin. June 8, 1945.
- M3** Comparison of the accuracy of slant range measurement by radar SCR-584 and burst-control telescopes in 90-mm gun trial fire. (Memorandum No. 16.) Alex L. Sweet. OEMsr-581; Service Project No. SOS-6; OSRD No. 5210. Tufts College. June 15, 1945.

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- M4** A further study of radar SCR-584 burst spotting on trial fire. (Report No. 16.) William C. Biel and Alex L. Sweet. OEMsr-581; Service Project No. SOS-6; OSRD No. 5930. Tufts College. September 25, 1945.
- 611.5 Miscellaneous Gunnery Trainer Problems**
- M1** A graphical recorder for synchronous linear registration of several mechanical movements. (Memorandum No. 3.) Karl U. Smith. OEMsr-1171; Service Project No. AC-94; OSRD No. 5937. University of Wisconsin. September 26, 1945.
- 612 Scoring and Recording Devices**
- M1** Recording unit for [master] trainer BC-1070-A. . . . Application instructions. (n.a.) OEMsr-919; Service Project Nos. SC-70 and NS-146. [Yerkes Laboratories of Primate Biology.] October 9, 1944.
- M2** Recording device for remote indication of gun position. (Informal Memorandum No. 2.) John P. Nafe, Lloyd V. Searle and Kenneth S. Wagoner. [OEMsr-581;] Service Project No. SOS-11. [Tufts College.] October 9, 1944.
- M3** Check sight scoring methods. (Report No. 1.) Henry P. Birmingham, A. S. Householder and others. OEMsr-815; Service Project No. N-111; OSRD No. 4525. Brown University. January 3, 1945.
- M4** Comparison of on-target method and the standard hand-scale method of scoring B-29 sight-camera film. (Report No. 3.) Robert R. Sears, E. B. Knauff and others. OEMsr-1171; Service Project No. AC-94; OSRD No. 5222. University of Wisconsin. June 19, 1945.
- M5** A system of automatic devices for the detection and recording of errors in a 105-mm howitzer battery. (Report No. 5.) Richard N. Berry, Robert H. Brown and others. OEMsr-581; Service Project No. SOS-11; OSRD No. 5313. Tufts College. July 6, 1945.
- M6** Studies of the reliability of the scoring system of the gunnery trainer, Mark 5. (Informal Memorandum No. 12.) William E. Kappauf. OEMsr-815; Service Project No. N-111. Brown University. August 29, 1945.
- M7** An investigation of the scoring characteristics of the machine gun trainer, Mark 1. (Memorandum No. 25.) Morris S. Viteles and John H. Gorsuch. OEMsr-700; Service Project No. N-105. [University of Pennsylvania.] September 20, 1945.
- 612.1 Errors**
- M1** The number, percentage, disposition and places of occurrence of 100-mil errors in 9440 rounds of artillery fire. (Informal Memorandum No. 3.) John P. Nafe. [OEMsr-581;] Service Project No. SOS-11. [Tufts College.] November 4, 1944.
- 613 Types of Ordnance**
- 613.1 Machine Gun**
- M1** Manual for instruction on machine gun trainer, Mark I. (n.a.) [OEMsr-700;] Service Project No. N-105. University of Pennsylvania and US Fleet, Headquarters of the Commander-in-Chief. January, 1944.
- M2** [Memorandum on:] Manual for instruction on machine gun trainer, Mark I. (Memorandum No. 15.) Morris S. Viteles and John H. Gorsuch. OEMsr-700; Service Project No. N-105. [University of Pennsylvania.] July 25, 1944.
- 613.2 Antiaircraft**
- M1** Use of Foxboro trainers in AAATC at Camp Stewart and Camp Davis. (Informal Memorandum No. 5.) Donald B. Lindsley. [OEMsr-919;] Service Project Nos. SC-70 and NS-146. [Yerkes Laboratories of Primate Biology and US Army Signal Corps, Southern Signal Corps School, Camp Murphy, Florida. December 21, 1943.
- M2** Use of Foxboro trainers in AAATC and AARTC units. Report of visits by representative of NDRC Projects SC-70 and NS-146. (Informal Memorandum No. 12.) Donald B. Lindsley. OEMsr-919; Service Project Nos. SC-70 and NS-146. [Yerkes Laboratories of Primate Biology and US Army Signal Corps, Southern Signal Corps School, Camp Murphy, Florida. March 15, 1944.
- M3** Study of operator performance on all types of antiaircraft equipment. (Report No. 17.) Richard N. Berry, William C. Biel and others. OEMsr-581; Service Project No. SOS-6; OSRD No. 5931. Tufts College. September 25, 1945.
- 620 Radar Trainers**
- 621 Oscilloscope Trainers**
- M1** Use of the Philco trainer in the training of A-scan oscilloscope operators. (Research Report No. 3.) (n.a.) OEMsr-919; Service Project Nos. SC-70 and NS-146; OSRD No. 2096. Yerkes Laboratories of Primate Biology and US Army Signal Corps, Southern Signal Corps School, Camp Murphy, Florida. October 15, 1943.
- 622 H₂X Film Trainer**
- M1** Instructor's guide for use of the H₂X film trainer with film commentaries. (n.a.) [OEMsr-919;] Service Project Nos. SC-70 and NS-146. [Yerkes Laboratories of Primate Biology.] January 25, 1945.
- M2** Memorandum on: Instructor's guide for H₂X film trainer with film commentaries. (Informal Memorandum No. 21.) Donald B. Lindsley. [OEMsr-919;] Service Project Nos. SC-70 and NS-146. [Yerkes Laboratories of Primate Biology and US Army Air Forces, Boca Raton Field, Florida. February 6, 1945.
- 623 Ranging with Radar**
- M1** The accuracy and precision of student operators'

zero-sets on the Mark 4 radar. (Report No. 4.) E. B. Knauft. OEMsr-1171; Service Project No. N-114; OSRD No. 3723. University of Wisconsin. May 18, 1944.

- M2** The design, attachment and precision of an auxiliary range dial for the Mark 4 radar. (Memorandum No. 5.) E. B. Knauft. OEMsr-1171; Service Project No. N-114; OSRD No. 3906. University of Wisconsin. July 17, 1944.
- M3** An experimental determination of variable errors in ranging on a surface target by radars, Marks 4, 8 and 10. (Report No. 17.) J. K. Adams, Florence E. Gray and E. B. Knauft. OEMsr-1171; Service Project No. N-114; OSRD No. 4688. University of Wisconsin. February 13, 1945.
- M4** A determination of zero drift and range drift after warm-up of radars, Marks 4, 8 and 12. (Report No. 18.) E. B. Knauft. OEMsr-1171; Service Project No. N-114; OSRD No. 4721. University of Wisconsin. February 20, 1945.

624 Miscellaneous Radar Trainers

- M1** Trainers for reporting and ground-controlled interception [radar] operators. (Informal Memorandum No. 1.) Donald B. Lindsley. [OEMsr-919;] Service Project Nos. SC-70 and NS-146. [Yerkes Laboratories of Primate Biology and US Army Signal Corps, Southern Signal Corps School, Camp Murphy, Florida. July 8, 1943.]
- M2** Validation of the modified Army BC-968-A radar trainer as a training device for aerial tracking of the Mark 37 gun director with Mark 4 radar. (Report No. 15.) E. B. Knauft, S. D. S. Spragg and H. A. Taylor. OEMsr-1171; Service Project No. N-114; OSRD No. 4476. University of Wisconsin. February 8, 1945.
- M3** Radar scope movies for briefing and reconnaissance purposes. (Informal Memorandum No. 30.) Donald B. Lindsley. OEMsr-919; Service Project Nos. SC-70 and NS-146. Yerkes Laboratories of Primate Biology and US Army Air Forces, Boca Raton Field, Florida. September 24, 1945.

630 Noise Equipment

- M1** Modified airplane noise generator. (Informal Communication No. 1.) (n.a.) [OEMsr-830;] Service Project Nos. N-109(1) and SC-67. The Psychological Corporation. January 24, 1944.
- M2** NDRC battle noise equipment, utilization at infiltration range. (Informal Memorandum No. 6.) Eugene L. Hartley. Service Project No. N-113. April 3, 1945.
- M3** Final summary of research on the use of battle noise equipment. (Report No. 12.) Eugene L. Hartley and Dorothea B. Jones. OEMsr-834; Service Project No. N-113; OSRD No. 4931. Brown University. April 12, 1945.

640 Range Estimation Equipment

- M1** The design, accuracy, construction and use of a

range-correction computer. (Memorandum No. 2.) J. K. Adams, D. G. Ellson and William E. Kappauf. OEMsr-1171; Service Project No. N-114; OSRD No. 3509. University of Wisconsin. March 22, 1944.

- M2** An investigation of the range-estimation trainer, Device 5C-4, as a method of teaching range estimation. (Memorandum No. 11.) Morris S. Viteles, John H. Gorsuch and others. OEMsr-700; Service Project No. N-105; OSRD No. 4263. University of Pennsylvania. October 18, 1944.
- M3** Learning range estimation on the firing line. (Memorandum No. 17.) Morris S. Viteles, John H. Gorsuch and others. OEMsr-700; Service Project No. N-105; OSRD No. 4405. University of Pennsylvania. November 30, 1944.
- M4** Aerial target range estimation. (Report No. 4.) M. W. Horowitz and William E. Kappauf. OEMsr-815; Service Project No. N-111; OSRD No. 5301. Brown University. July 3, 1945.
- M5** Evaluation of methods of training in estimating a fixed opening range. (Memorandum No. 23.) M. H. Rogers, S. J. Spol and others. OEMsr-700; Service Project No. N-105; OSRD No. 5765. University of Pennsylvania. September 19, 1945.
- M6** Manual for instruction on mirror range estimation trainer, Device 5C-4, equipped with Mark 14 sight reticle. (Memorandum No. 24.) D. D. Wickens, John H. Gorsuch and Morris S. Viteles. OEMsr-700; Service Project No. N-105; OSRD No. 5925. University of Pennsylvania. September 25, 1945.
- M7** A comparison of free and stadiametric estimation of opening range. (Memorandum No. 29.) Harold A. Voss and D. D. Wickens. OEMsr-700; Service Project No. N-105; OSRD No. 6114. University of Pennsylvania. October 16, 1945.

650 Stereoscopic Trainers and Related Equipment

651 Range Finders

- M1** The design, accuracy, construction and use of a range finder slide rule. (Memorandum No. 3.) J. K. Adams and T. R. Whitney. OEMsr-1171; Service Project No. N-114; OSRD No. 3678. University of Wisconsin. May 1, 1944.
- M2** The design, construction and use of a motor drive providing range movement and tracking errors for the Mark 2 or M-2 stereoscopic trainers. (Memorandum No. 6.) D. G. Ellson and E. B. Knauft. OEMsr-1171; Service Project No. N-114; OSRD No. 3907. University of Wisconsin. July 17, 1944.

651.1 Mark 42

- M1** The precision of internal adjustment settings of the Mark 42 range finder. (Report No. 3.) E. B. Knauft. OEMsr-1171; Service Project No. N-114; OSRD No. 3618. University of Wisconsin. April 24, 1944.
- M2** A comparison of five methods of calibrating the Mark 42 range finder. (Report No. 8.) H. A.

Taylor. OEMsr-1171; Service Project No. N-114; OSRD No. 3977. University of Wisconsin. August 4, 1944.

- M3** An investigation of the effect of brightness contrast upon operators' errors in ranging on aerial targets with the Mark 42 range finder. (Report No. 11.) D. G. Ellson and H. A. Taylor. OEMsr-1171; Service Project No. N-114; OSRD No. 4380. University of Wisconsin. November 27, 1944.

652 Height Finders

- M1** The use of a template in making the interocular setting on the height finder. (Project Memorandum No. 2.) William E. Kappauf and W. J. Brogden. OEMsr-815; Research Project No. PDRC-759; OSRD No. 1373. Brown University. April 7, 1943.
- M2** A model of the optics of the stereoscopic height finder. (Project Memorandum No. 5.) William E. Kappauf. OEMsr-815; Research Project No. PDRC-759; OSRD No. 1396. Brown University. April 26, 1943.
- M3** The adjustment of the M-2 trainer for standard testing. (Project Memorandum No. 9.) Harold M. Fisher and Henry A. Imus. OEMsr-815; [Research Project No. PDRC-759;] OSRD No. 1638. Brown University. June 17, 1943.
- M4** A study of backlash between the main bearing race and the bevel pinion in M-1 and M-2 height finders. (Report No. 8.) William C. Biel, William E. Kappauf and E. B. Knaft. OEMsr-815; [Research Project No. PDRC-759;] Brown University. September 9, 1943.
- M5** Height of image adjustment on the stereoscopic height finder. (Report No. 5.) J. K. Adams, William C. Biel and others. OEMsr-815; [Research Project No. PDRC-759;] OSRD No. 1967. Brown University. September 15, 1943.
- M6** The calibration of Army height finders. (Report No. 9.) William C. Biel, William E. Kappauf and E. B. Knaft. OEMsr-815; [Research Project No. PDRC-759;] OSRD No. 3375. Brown University. March 18, 1944.

653 Interpupillary Measurements

- M1** An instrument for the measurement of interpupillary distance. (Report No. 2.) William E. Kappauf and W. J. Brogden. OEMsr-815; Research Project No. PDRC-759; OSRD No. 1372. Brown University. April 6, 1943.
- M2** A comparison of methods for setting the oculars of the height finder at the interpupillary distance of the observer. (Report No. 6.) J. K. Adams, William C. Biel and others. OEMsr-815; [Research Project No. PDRC-759;] OSRD No. 1968. Brown University. September 15, 1943.
- M3** The precision of setting the oculars of the range finder with interpupillary distance templates of different design. (Report No. 1.) J. K. Adams. OEMsr-1171; Service Project No. N-114; OSRD No. 3273. University of Wisconsin. February 2, 1944.

654 Miscellaneous Stereoscopic Trainer Problems

- M1** Preliminary suggestions for a stereoscopic spotting trainer. (Project Memorandum No. 3.) Lorrin A. Riggs. OEMsr-815; Research Project No. PDRC-759; OSRD No. 1374. Brown University. April 3, 1943.
- M2** A new motor attachment for the M-2, or Mark II stereoscopic trainer. (Project Memorandum No. 4.) William E. Kappauf. OEMsr-815; Research Project No. PDRC-759; OSRD No. 1392. Brown University. April 26, 1943.

660 Plan Position Indicator (PPI) Trainer

- M1** Plan position indicator trainer equipment. (Informal Memorandum No. 7.) Donald B. Lindsley. [OEMsr-919;] Service Project Nos. SC-70 and NS-146. [Yerkes Laboratories of Primate Biology and US Army Signal Corps, Southern Signal Corps School,] Camp Murphy, Florida. January 8, 1944.
- M2** A radar trainer and flash-reading method for operators of the plan position indicator. (Research Report No. 14.) Irving H. Anderson, Alfred L. Baldwin and others. OEMsr-919; Service Project Nos. SC-70 and NS-146; OSRD No. 4489. Yerkes Laboratories of Primate Biology. December 23, 1944.
- M3** Use of the plan position indicator flash-reading trainer in training Navy search radar operators. (Research Report No. 17.) Irving H. Anderson, Alfred L. Baldwin and others. OEMsr-919; Service Project Nos. SC-70 and NS-146; OSRD No. 4831. Yerkes Laboratories of Primate Biology. March 20, 1945.

670 Interphone Crew Trainer

- M1** Interphone crew trainer. Installation and operation. (Memorandum No. 10.) G. Paul Moore and E. J. O'Brien. OEMsr-830; Service Project No. SC-67; OSRD No. 5363. The Psychological Corporation. August 4, 1945.

680 Electric Winch Trainer

- M1** Instruction in operation of electric winch trainer. (Preliminary edition.) (n.a.) OEMsr-1372; Service Project No. N-116b. University of Southern California and US Pacific Fleet, Fleet Operational Training Command. December, 1944.
- M2** Validation of miniature electric winch as a training device. (Informal Memorandum No. 3.) Floyd L. Ruch. OEMsr-1372; Service Project No. N-116b. University of Southern California. February 5, 1945.
- M3** Evaluation of a subjective and an objective technique of rating winch operating ability. (Informal Memorandum No. 4.) Floyd L. Ruch. OEMsr-1372; Service Project No. N-116b. University of Southern California. February 28, 1945.

690 Miscellaneous Trainer Problems

- M1** Proposed recording system for students' performance on the Trainer BC-1070-A. (Informal Memorandum No. 11.) Donald B. Lindsley. [OEMsr-919;] Service Project Nos. SC-70 and NS-146. [Yerkes Laboratories of Primate Biology and US Army Signal Corps, Southern Signal Corps School, Camp Murphy, Florida. March 8, 1944.
- M2** Notes on the desired characteristics of trainers. (Memorandum No. 7.) William E. Kappauf. [OEMsr-815;] Service Project No. N-111. Advanced

Fire Control School, Navy Yard, Washington, D. C. [and Brown University]. January 2, 1945.

- M3** The use of design of synthetic trainers for military training. Dael Wolfe. OSRD No. 5246. July 6, 1945.
- M4** Proceedings of Part I of the Joint Army-Navy-OSRD Conference on psychological problems in military training. [Conference held] August 15 and 16, 1945 [at the] Departmental Auditorium, Washington, D. C. Edited by: John L. Kennedy. OSRD No. 6079. October 11, 1945.

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CROSS REFERENCE

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A

Absorbents

- gas mask Div. 9-550-M2
Div. 10-200-M2
Div. 10-200-M3
Div. 10-202
Div. 10-202.151
- foreign Div. 10-202.01
- granular (in air purification) Div. 11-105.21
- manganese (oxygen production) Div. 11-102.211-M14
- radar
See: Coatings, antireflective (radar countermeasures)

Absorption

- atmospheric (wave propagation) Div. CP-510
- underwater sound (by coated steel plates) Div. 6-552-M17

Absorption coefficients

- underwater sound Div. 6-510.222

AC

- See: Hydrogen cyanide (AC, HCN)*

AC-82 Project

- See: Detection, magnetic airborne (MAD) land targets*

Accelerometers

- fire control Div. 7-323
- Linderman Div. 4-326.2
- photoelectric Div. 4-326.1
- projectile Div. 1-210.31-M1
- toss-bombing Div. 4-326
Div. 4-326.3

Accumulators

- bladder (for tanks) Div. 12-1512-M8
- high-speed electronic Div. 17-436.2-M2

Acetic acid

- mustard gas detection Div. 9-422.115-M3
Div. 9-422.116
Div. 9-422.117

Acetoin utilization

- effect of mustard gas Div. 9-312.131-M20

Acetylene

- removal from air Div. 11-105.23
- derivative preparation Div. 9-234

Acid halides

- See: Halides, acid*

Acid ointments

- Div. 9-514
Div. 9-514.4
- vehicles Div. 9-514.3

Acids

- See: specific acids (e.g., Acetic acid)*

ACL-1

- See: Jet-propulsion equipment, ACL-1 unit*

Acoustic direction finding equipment

- See: Direction finders, acoustic*

Acoustic marine pinging speedometer

- See: Speedometers, acoustic marine pinging (AMPS)*

Acoustic marine speedometer

- See: Speedometers, acoustic marine (AMS)*

Acoustic proximity fuzes

- See: Fuzes, acoustic proximity*

Acoustic wakes

- See: Wakes, acoustic*

Acoustics Div. 17-400

- magnetostrictive transducer Div. 6-612.2

- underwater Div. 6-113

Div. AMP-201

- Japanese equipment Div. 6-556.1-M35

- See also: Hearing; Noise; Sound*

Acrylonitrile Div. 9-225

Activated charcoal

- See: Charcoal, activated*

Activity preference blank Div. APP-112.1

Acuity (in height finding) Div. APP-121

Adaptometers

- See: Dark adaptometers*

ADE

- See: Audible doppler enhancer (ADE)*

Adenylic acid Div. 9-312.11-M5

Adhesives (for magnetostrictive hydrophones) Div. 6-612.44

Adiabatics

- air explosions Div. 2-120-M5
- chelate compounds Div. 11-102.211-M19

Adjustable-time fuzes

- See: Fuzes, variable-time*

Adsorption wave (in charcoal and

whetlerite) Div. 10-202.157

Aerial combat

- See: Gunnery, aerial*

Aeroballistics Div. AMP-502

Aerodynamics Div. 5-100

- controlled-trajectory bombs Div. 4-242.11-M1

- torpedoes Div. 6-810

Aerorefectance Div. 16-240-M1

Aerosols Div. 10-100

Div. 10-101

Div. 10-102

Div. 10-500

Div. AMP-900-M5

- deposition Div. 10-501.12

- filler for domes Div. 6-612.44-M1

- solid Div. 10-504.3

- See also: Drop dispersion in liquids;*

- Fog; Smoke*

AEW

- See: Airborne early warning (AEW)*

AF-1

- See: Fluoroacetates, methyl*

After-burning (rockets) Div. 4-222.128-M4
 Div. 4-222.129-M3
 Div. 4-238.212
 Div. 4-411.11
See also: Early functioning, variable-time fuze
 Afternoon effect Div. 6-510.4-M2
 AGC
See: Automatic gain control (AGC)
 AGL-1
See: Aircraft gun-laying radar (AGL)
 AI-10 Trainers Div. 14-411.21
 AIA Div. 14-234.323
 Div. 14-242.12-M3
 AIBR Project Div. 4-221-M1
 Aichi (Japanese aircraft) Div. 18-802.12-M17
 Aiming
 aerial gunnery accuracy Div. AMP-502.1-M17
 Div. AMP-503.6-M12
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See also: Sights and Sighting
 Aim-wander (aerial gunnery) Div. AMP-502.1-M9
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 dielectric constant and loss Div. CP-522.2
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 Air curtains (fog dissipation) Div. 10-503.2-M4
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 Air travel-to-arming Div. 4-244.1
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 Div. 14-234.122-M10
 Div. 14-321.14
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See also: Early warning radar; Microwave early warning (MEW)
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 Final report for Division 6 Div. 6-112-M1
 Airborne range only (ARO) Div. 14-214.3-M3
 Div. 14-264-M6
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- Aircraft radio sight (ARS) Div. 14-323.12-M1
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- effect of impact on Div. 2-432.2
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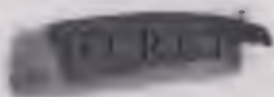
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SECRET

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14	329.16-M2	411.1-M2	97	17	322.2-M2	323.61-M3	374
14	411.1-M3	411.4-M1	98	17	323.61-M4	323.81-M1	375
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15	341-M2	341.4-M8	302	18	103.3-M1	201.1-M1	120
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AMP	11-M5	21.1-M4 (Sect. 1-3)	24	APP	212-M1	215-M1	208
AMP	21.1-M4 (Sect. 4, App.)	101.1-M12	25	APP	216-M1	218.2-M7	209
AMP	101.1-M13	201-M8	26	APP	218.2-M8	311-M1	210
AMP	201-M9	401-M1	27	APP	311-M2	318-M5	211
AMP	401-M2	404-M1	28	APP	318-M6	411-M2	212
AMP	404-M2	406-M7	29	APP	411-M3	521-M2	213
AMP	407-M1	502.1-M34	30	APP	521-M3	611.1-M7	214
AMP	502.1-M35	502.14-M7	31	APP	611.1-M8	611.3-M6	215
AMP	502.14-M8	503.2-M3	32	APP	611.3-M7	690-M4	216
AMP	503.2-M4	503.5-M8	33	CP	100-M1	100-M4	232
AMP	503.5-M9	503.7-M4	34	CP	110-M1	202-M1	233
AMP	503.7-M5	504.1-M17	35	CP	202.1-M1	203.1-M1	234
AMP	504.1-M18	504.41-M8	36	CP	203.1-M2	211-M16	235
AMP	504.41-M9	504.51-M6	37	CP	212-M1	222.1-M6	236
AMP	504.51-M7	606.2-M1	38	CP	222.1-M7	231.22-M3	237
AMP	700-M1	703.4-M8	39	CP	231.221-M1	233-M7	238
AMP	703.4-M9	801.1-M5	40	CP	233-M8	333.1-M2	239
AMP	801.1-M6	803.1-M9	41	CP	333.1-M3	425-M1	240
AMP	803.1-M10	804.3-M1	42	CP	425-M2	532.1-M1	241
AMP	804.3-M2	902-M2	43	CP	532.1-M2	621.1-M2	242
AMP	902-M3	905.2-M4	44	CP	621.1-M3	732.1-M2	243
APP	110-M1	211-M1	207	TD	100-M1	101.3-M3 (cont)	217
				TD	101.3-M3	102.4-M1	218

SECRET

MICROFILM REEL CATALOGUE

According to Reels

Reel Number	Division Number	Index No.		Reel Number	Division Number	Index No.	
		From	To			From	To
1	12	100-M1	300-M11	51	14	132-M6	211.4-M5
2	12	400-M1	510-M5	52	14	211.4-M6	212.1-M2
3	12	510-M6	1000-M3	53	14	212.1-M3	212.8-M9
4	12	1100-M1	1420-M5	54	14	213-M1	214.4-M6
5	12	1420-M6	1710-M5	55	14	214.5-M1	231-M5
6	12	1710-M6	1820-M2	56	14	231-M6	231.221-M3
7	12	1820-M3	1860-M1	57	14	231.221-M4	232.1-M8
8	12	1860-M2	1920-M3	58	14	232.11-M1	232.14-M2
9	12	1930-M1	2000-M6	59	14	232.141-M1	232.18-M2
	6 Vol. 16	632-M1	632.12-M5	60	14	232.19-M1	233.111-M13
10	6 Vol. 16	632.12-M6	632.41-M7	61	14	233.111-M14	233.13-M2
11	6 Vol. 16	632.41-M8	632.62-M15	62	14	233.13-M3	233.31-M7
12	6 Vol. 16	632.62-M16	632.63-M16	63	14	233.31-M8	233.412-M17
	6 Vol. 13	612.1-M1	612.22-M9	64	14	233.412-M18	233.423-M10
13	6 Vol. 13	612.22-M10	612.511-M7	65	14	233.423-M11	234.122-M18
14	6 Vol. 13	612.512-M1	612.62-M5	66	14	234.123-M1	234.233-M3
15	6 Vol. 13	612.62-M6	612.713-M6	67	14	234.31-M1	234.33-M5
16	6 Vol. 13	612.713-M7	612.8-M20	68	14	234.4-M1	234.52-M3
	6 Vols. 10-11	551-M1	551-M5	69	14	234.6-M1	241.32-M8
17	6 Vols. 10-11	551-M6	552-M11	70	14	241.4-M1	241.42-M3
18	6 Vols. 10-11	552-M12	553.2-M5	71	14	241.42-M4	242.21-M3
19	6 Vols. 10-11	553.2-M6	554.1-M5	72	14	242.22-M1	242.233-M2
20	6 Vols. 10-11	554.1-M6	554.4-M1	73	14	242.233-M3	243.1-M4
21	6 Vols. 10-11	554.4-M2	555-M22	74	14	243.1-M5	251-M1
22	6 Vols. 10-11	555-M23	556.1-M28	75	14	251.1-M1	251.3-M7
23	6 Vols. 10-11	556.1-M29	556.2-M7	76	14	251.3-M8	251.6-M12
	AMP	11-M1	11-M4	77	14	251.6-M13	252.41-M9
24	AMP	11-M5	21.1-M4 (Sect. 1-3)	78	14	252.42-M1	261.1-M1
25	AMP	21.1-M4 (Sect. 4, App.)	101.1-M12	79	14	261.1-M2	264-M6
26	AMP	101.1-M13	201-M8	80	14	264-M7	265.1-M8
27	AMP	201-M9	401-M1	81	14	265.1-M9	310.1-M1
28	AMP	401-M2	404-M1	82	14	310.11-M1	310.212-M3
29	AMP	404-M2	406-M7	83	14	310.213-M1	321.14-M3
30	AMP	407-M1	502.1-M34	84	14	321.14-M4	321.14-M16
31	AMP	502.1-M35	502.14-M7	85	14	321.14-M17	322.1-M4
32	AMP	502.14-M8	503.2-M3	86	14	322.1-M5	322.2-M4
33	AMP	503.2-M4	503.5-M8	87	14	322.3-M1	323.12-M6
34	AMP	503.5-M9	503.7-M4	88	14	323.12-M7	323.2-M10
35	AMP	503.7-M5	504.1-M17	89	14	323.2-M11	323.5-M1
36	AMP	504.1-M18	504.41-M8	90	14	323.5-M2	323.6-M7
37	AMP	504.41-M9	504.51-M6	91	14	323.6-M8	327-M2
38	AMP	504.51-M7	606.2-M1	92	14	327-M3	327.114-M5
39	AMP	700-M1	703.4-M8	93	14	327.114-M6	328.112-M4
40	AMP	703.4-M9	801.1-M5	94	14	328.113-M1	329.11-M2
41	AMP	801.1-M6	803.1-M9	95	14	329.12-M1	329.132-M3
42	AMP	803.1-M10	804.3-M1	96	14	329.132-M4	329.16-M1
43	AMP	804.3-M2	902-M2	97	14	329.16-M2	411.1-M2
44	AMP	902-M3	905.2-M4	98	14	411.1-M3	411.4-M1
	14	111-M1	111-M6	99	14	411.5-M1	422.1-M3
45	14	111-M7	121.1-M2	100	14	422.1-M4	501-M9
46	14	121.1-M2		101	14	501-M10	501-M11
		(Chap. 22)	122.1-M1	102	14	501-M12	501-M15
47	14	122.1-M2	122.13-M5	103	14	501-M16	503-M3
48	14	122.2-M1	131.1-M2	104	14	504-M1	600-M6
49	14	131.1-M3	132-M2	105	6 Vols. 6-9	500-M1	501.12-M3
50	14	132-M3	132-M5	106	6 Vols. 6-9	501.2-M1	510.11-M4
				107	6 Vols. 6-9	510.11-M5	510.21-M1

Reel Catalogue According to Reels (cont'd)

Reel Number	Division Number	Index No.		Reel Number	Division Number	Index No.	
		From	To			From	To
108	6 Vols. 6-9	510.21-M2	510.23-M12	164	11	206.11-M5	
109	6 Vols. 6-9	510.23-M13	520.2-M1			(Part II)	206.41-M2
110	6 Vols. 6-9	520.2-M2	530.23-M3	165	11	206.5-M1	208.12-M1
111	6 Vols. 6-9	530.23-M4	540.4-M2	166	11	208.12-M2	208.22-M3
		560.1-M1	560.21-M5	167	11	208.22-M4	208.41-M2
112	6 Vols. 6-9	560.21-M6	570.21-M12	168	11	208.42-M1	301.144-M2
113	6 Vols. 6-9	570.21-M13	580.33-M3	169	11	301.144-M3	301.15-M12
114	18	10-M1	101.1-M3	170	11	301.16-M1	301.4-M5
115	18	101.1-M4	101.12-M6	171	11	301.4-M6	302.13-M3
116	18	101.12-M7	102-M3	172	11	302.2-M1	302.322-M4
117	18	102-M4	102.12-M5	173	11	302.322-M5	302.52-M1
118	18	102.12-M6	102.3-M2	174	11	302.52-M2	303.11-M8
119	18	102.3-M3	103.2-M4	175	11	303.11-M9	303.13-M4
120	18	103.3-M1	201.1-M1	176	11	303.14-M1	304.21-M7
121	18	201.1-M2	202.12-M1	177	13	100-M1	101.21-M4
122	18	202.12-M2	207-M1	178	13	101.3-M1	102.21-M9
123	18	207-M2	302.3-M1	179	13	103.1-M1	104.1-M2
124	18	302.3-M2	401-M2	180	13	200-M1	200.2-M2
125	18	402.1-M1	502.1-M3	181	13	200.2-M3	201.2-M1
126	18	502.1-M4	503-M1	182	13	202.1-M1	204-M3
127	18	503-M2	601.131-M4	183	13	204-M4	207.2-M1
128	18	601.131-M5	601.14-M4	184	13	207.31-M1	302-M1
129	18	601.15-M1	601.171-M6	185	13	302-M2	303-M2
130	18	601.171-M7	601.22-M7	186	13	303-M3	304.3-M1
131	18	601.23-M1	601.33-M1		13 Vol. 2B	1941-M1	1944-M6
132	18	601.33-M2	602.1-M11	187	13 Vol. 2B	1944-M7	1944-M13
133	18	602.11-M1	602.4-M2	188	13 Vol. 2B	1944-M14	1944-M28
134	18	602.51-M1	702-M10	189	13 Vol. 2B	1945-M1	N.D.-M4
135	18	703-M1	801.21-M19	190	6 Vol. 21	800-M1	810.1-M5
136	18	801.21-M20	801.3-M3	191	6 Vol. 21	810.1-M6	830.21-M2
137	18	801.3-M4	802.12-M19	192	6 Vol. 22	900-M1	911.1-M1
138	18	802.12-M20	802.21-M15	193	6 Vol. 22	911.1-M2	912-M1
139	18	802.21-M16	802.23-M20	194	6 Vol. 22	912.1-M1	920-M4
140	18	802.23-M21	902.11-M6	195	6 Vol. 22	921.1-M1	923-M5
141	18	902.11-M7	902.15-M2	196	6 Vol. 22	923-M6	935-M3
142	18	902.2-M1	902.4-M2	197	6 Vol. 2B	201-M1	201-M8
143	11	101-M1	101-M7	198	6 Vol. 14	621-M1	622.1-M5
144	11	101-M8	102-M1	199	6 Vol. 14	622.2-M1	623.2-M6
145	11	102-M2	102.1-M1	200	6 Vol. 14	623.2-M7	624.3-M2
146	11	102.1-M2	102.111-M4	201	6 Vol. 14	624.3-M3	626.2-M4
147	11	102.111-M5	102.21-M7	202	6 Vol. 5	401-M1	423.2-M4
148	11	102.211-M1	102.211-M9	203	6 Vol. 5	424-M1	432.2-M6
149	11	102.211-M10	102.211-M34	204	6 Vol. 5	441-M1	442-M6
150	11	102.211-M35	102.212-M12	205	6 Vol. 5	442-M7	451-M2
151	11	102.212-M13	103.1-M6	206	6 Vol. 5	451.1-M1	470-M7
152	11	103.1-M7	103.4-M5	207	APP	110-M1	211-M1
153	11	103.4-M6	104.11-M4	208	APP	212-M1	215-M1
154	11	104.12-M1	104.12-M3	209	APP	216-M1	218.2-M7
155	11	104.12-M4	104.2-M3	210	APP	218.2-M8	311-M1
156	11	104.2-M4	106.21-M5	211	APP	311-M2	318-M5
157	11	106.21-M6	200.1-M4	212	APP	318-M6	411-M2
158	11	200.1-M5	200.1-M7	213	APP	411-M3	521-M2
159	11	200.1-M8		214	APP	521-M3	611.1-M7
160	11	201.1-M1	203.4-M3	215	APP	611.1-M8	611.3-M6
161	11	203.4-M4	203.522-M1	216	APP	611.3-M7	690-M4
162	11	203.523-M1	204.2-M6	217	TD	100-M1	101.3-M3 (cont)
163	11	204.2-M7	206.11-M5 (Part I)	218	TD	101.3-M3	102.4-M1

Reel Catalogue According to Reels (cont'd)

Reel Number	Division Number	Index No.		Reel Number	Division Number	Index No.	
		From	To			From	To
219	2	100-M1		271	16	302.11-M6	304.1-M2
220	2	110-M1	111.11-M6	272	16	304.2-M1	310.221-M5
221	2	111.11-M7	120-M8	273	16	310.221-M6	310.322-M1
222	2	130-M1		274	16	310.322-M2	411.1-M5
223	2	131-M1	210-M1	275	16	411.11-M1	430-M1
224	2	210-M2	220-M15	276	16	431-M1	470-M1
225	2	220-M16	240-M6	277	6 Vol. 4	300-M1	312-M3
226	2	240-M7	300-M1	278	6 Vol. 4	321.1-M1	322.1-M3
227	2	310-M1	410-M4	279	6 Vol. 4	322.1-M4	323.2-M6
228	2	420-M1	431.22-M6	280	6 Vol. 4	323.2-M7	326.3-M5
229	2	431.22-M7	510-M1	281	6 Vol. 18	641.1-M1	642.2-M1
230	2	510-M2	521-M3	282	6 Vol. 18	642.2-M2	644.12-M3
231	2	521-M4	540-M2	283	6 Vol. 18	644.13-M1	645.13-M3
232	CP	100-M1	100-M4	284	6 Vol. 18	645.14-M1	646.21-M6
233	CP	110-M1	202-M1	285	6 Vol. 18	646.21-M7	647-M1
234	CP	202.1-M1	203.1-M1	286	15	110-M1 (cont)	
235	CP	203.1-M2	211-M16	287	15	110-M1 (cont)	
236	CP	212-M1	222.1-M6	288	15	110-M1	121-M1
237	CP	222.1-M7	231.22-M3	289	15	122-M1	211-M1
238	CP	231.221-M1	233-M7	290	15	211-M2	211.214-M2
239	CP	233-M8	333.1-M2	291	15	211.214-M3	221.12-M2
240	CP	333.1-M3	425-M1	292	15	221.12-M3	221.33-M2
241	CP	425-M2	532.1-M1	293	15	221.4-M1	232-M6
242	CP	532.1-M2	621.1-M2	294	15	241-M1	250-M1
243	CP	621.1-M3	732.1-M2	295	15	250-M2	311.124-M4
244	7	101-M1	101-M2 (Vols. I,	296	15	311.125-M1	313.22-M2
245	7	101-M2 (Vols. IV, V)	II, III)	297	15	313.22-M3	322.15-M6
246	7	111-M1	112.2-M4	298	15	322.16-M1	331.1-M1
247	7	112.2-M5	112.2-M15	299	15	331.1-M2	332-M2
248	7	112.2-M16	121.2-M1	300	15	332-M3	333.21-M4
249	7	122.1-M1	122.3-M5	301	15	333.21-M5	341-M1
250	7	122.3-M6	201-M2	302	15	341-M2	341.4-M8
251	7	201-M3	201-M5	303	15	341.4-M9	341.6-M5
252	7	201-M6	201-M8	304	15	341.6-M6	343.243-M1
253	7	210-M1	210.11-M7	305	15	343.243-M2	371.1-M9
254	7	210.11-M8	210.15-M3	306	15	371.1-M10	402.1-M1
255	7	210.15-M4	210.31-M9	307	15	402.1-M2	403.2-M3
256	7	210.31-M10	220.12-M6	308	15	403.3-M1	513-M7
257	7	220.12-M7	220.14-M12	309	15	513-M8	640-M2
258	7	220.15-M1	220.311-M1	310	15	641-M1	840-M1
259	7	220.311-M2	312.2-M1	311	8	10-M1	101-M15
260	7	312.2-M2	321.2-M2	312	8	101-M16	101.2-M2
261	7	321.2-M3	324-M2	313	8	101.2-M3	103.1-M8
262	16	101-M1	111.11-M8	314	8	103.1-M9	105-M3
263	16	111.11-M9	111.3-M11	315	8	105-M4	109-M2
264	16	111.3-M12	111.6-M4	316	8	109-M3 (cont)	
265	16	112.1-M1	121.1-M1	317	8	109-M3	110-M1 (cont)
266	16	121.1-M2	144-M3	318	8	110-M1	110.3-M1
267	16	150-M1	161.12-M1	319	8	110.3-M2	201-M2
268	16	161.12-M2	180-M2	320	8	201-M3	202-M18
269	16	180-M3	250-M1	321	8	203-M1	400-M3
269A	16	250-M2 (Part I, Sect. II, Supp. 7)		322	8	400-M4	402-M1 (cont)
269B	16	250-M2 (Part I, Sect. II, Supp. 8)	273-M1	323	8	402-M1	405-M1 (cont)
270	16	281-M1	302.11-M5	324	8	405-M1	406-M9
				325	8	500-M1	501-M2
				326	8	501-M3	602.2-M2
				327	8	602.2-M3	602.2-M18

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Reel Number	Division Number	Index No.		Reel Number	Division Number	Index No.	
		From	To			From	To
328	8	602.2-M19	603.1-M7	385	17	436.321-M2	436.324-M2
329	8	603.1-M8	604.2-M1 (cont)	386	17	436.324-M3	436.51-M3
330	8	604.2-M1 (cont)		387	17	436.51-M4	437.3-M1
331	8	604.2-M1 (cont)		388	17	438.1-M1	443-M1
332	8	604.2-M1 (cont)		389	17	443-M2	443.23-M3
333	8	604.2-M1	605.1-M2	390	17	443.23-M4	452-M1
334	8	605.1-M3	607-M1 (cont)	391	17	453-M1	630-M1
335	8	607-M1	607.4-M3	392	6 Vol. 19	651-M1	651.32-M4
336	8	607.4-M4	607.5-M2 (cont)	393	6 Vol. 19	651.32-M5	653-M1
337	8	607.5-M2	607.6-M1	394	4	100-M1	100-M2
338	8	607.6-M2	701-M1	395	4	100-M3	211.1-M5
339	8	701-M2	803-M2	396	4	211.1-M6	211.23-M4
340	10	101-M1	200-M7	397	4	211.23-M5	222.111-M3
341	10	200-M8	201.22-M5	398	4	222.112-M1	222.128-M39
342	10	201.22-M6	202.1-M10	399	4	222.129-M1	231.2-M3
343	10	202.1-M11	202.13-M13	400	4	231.3-M1	232.23-M8
344	10	202.13-M14	202.131-M8	401	4	232.23-M9	238.3-M2
345	10	202.131-M9	202.141-M10	402	4	238.3-M3	242.12-M4
346	10	202.141-M11	202.154-M9	403	4	242.13-M1	311-M5
347	10	202.154-M10	202.157-M8	404	4	311-M6	321.1-M5
348	10	202.16-M1	300-M2	405	4	321.11-M1	325-M8
349	10	300-M3	402.2-M2	406	4	325-M9	412.1-M1
350	10	402.2-M3	500-M1	407	4	412.1-M2	422.1-M5
351	10	500-M2	501.11-M8	408	4	422.1-M6	770-M3
352	10	501.11-M9	502-M5	409	5	10-M1	221-M2
353	10	502-M6	504.2-M9	410	5	221-M3	222-M6
354	10	504.2-M10	602.121-M1	411	5	222-M7	231-M5
355	10	602.121-M2	602.23-M4	412	5	232.1-M1	240-M1
356	6 Vol. 12	600-M1	611.2-M6	413	5	240-M2	320-M2 (Sec. I, II)
357	6 Vol. 15	631-M1	631.31-M4	414	5	320-M2 (Sec. III, IV)	331-M3
358	6 Vol. 15	631.31-M5	631.45-M4	415	5	332-M1	350-M4
359	6 Vol. 15	631.45-M5	633.24-M3	416	5	360-M1	421.23-M1
360	6 Vol. 15	633.3-M1	634.2-M4	417	1	100-M1	210.1-M8
361	6 Vol. 17	635.1-M1	635.213-M4	418	1	210.1-M9	210.3-M3
362	6 Vol. 17	635.22-M1	635.5-M7	419	1	210.3-M4	310-M5
363	6 Vol. 20	700-M1	721.2-M3	420	1	310-M6	340-M2
364	6 Vol. 20	721.2-M4	723-M6	421	1	340-M3	400-M3
365	6 Vol. 1	111.1-M1	112-M1 (cont)	422	1	400-M4	410.2-M3
366	6 Vol. 1	112-M1	112.11-M1 (cont)	423	1	410.3-M1	420.31-M2
367	6 Vol. 1	112.11-M1	112.2-M1	424	1	420.31-M3	420.32-M4
368	6 Vol. 1	112.3-M1	125-M1	425	1	420.32-M5	510.1-M3
369	17	100-M1	111.3-M1	426	1	510.1-M4	530-M3
370	17	111.3-M2	122.1-M4	427	1	530-M4	650-M2
371	17	122.2-M1	222.1-M2	428	3	110-M1	110-M6
372	17	222.1-M3	312-M2	429	3	110-M7	120-M3 (cont)
373	17	312-M3	322.2-M1	430	3	120-M3	
374	17	322.2-M2	323.61-M3	431	3	130-M1	211-M2
375	17	323.61-M4	323.81-M1	432	3	211-M3	222-M2
376	17	323.82-M1	422-M3	433	3	222-M3	248-M3
377	17	423-M1	425-M7	434	3	249-M1	320-M5
378	17	425-M8	434.2-M2	435	3	320-M6	350-M1
379	17	434.2-M3	434.411-M1	436	3	351-M1	361.21-M2
380	17	434.412-M1	435.12-M2	437	3	361.21-M3	361.23-M1
381	17	435.12-M3	435.22-M2	438	3	361.24-M1	361.514-M5
382	17	435.23-M1	436.2-M3	439	3	361.514-M6	400-M1
383	17	436.2-M4	436.31-M9	440	3	400-M2	415-M10
384	17	436.321-M1					

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Reel Catalogue According to Reels (cont'd)

Reel Number	Division Number	Index No.		Reel Number	Division Number	Index No.	
		From	To			From	To
441	3	420-M1	450-M3	465	9	221.1-M9	222.4-M2
442	3	460-M1	491.21-M1	466	9	222.4-M3	231.2-M2
443	3	491.211-M1	491.232-M10	467	9	231.2-M3	241-M8
444	3	491.233-M1	520-M4	468	9	241-M9	300-M1
445	3	520-M5	531.2-M4	469	9	300-M2	312.12-M2
446	3	531.3-M1	532.2-M2	470	9	312.12-M3	313.1-M1
447	3	532.2-M3	540-M5	471	9	313.1-M2	322.1-M6
448	3	540-M6	570-M2	472	9	322.1-M7	361.2-M2
449	3	570-M3	610-M3	473	9	361.3-M1	386.2-M2
450	3	610-M4	615-M2	474	9	386.2-M3	413.3-M3
451	3	621-M1	626-M1	475	9	413.3-M4	421.2-M2
452	3	626-M2	722.4-M2	476	9	421.3-M1	422.115-M3
453	3	722.4-M3	821-M1	477	9	422.115-M4	422.7-M4
454	3	821-M2	831-M5	478	9	422.7-M5	511.2-M3
455-456	3	831-M6	880-M1	479	9	511.3-M1	522.11-M5
457	9	10-M1	10-M3	480	9	522.12-M1	540-M1
458	9	110-M1	110-M2	481	9	540-M2	541.113-M1
459	9	110-M3	125-M1	482	9	541.113-M2	542.1-M3
460	9	125-M2 (cont)		483	9	542.1-M4	562-M1
461	9	125-M2	200-M8	484	9	562-M2	600-M9
462	9	200-M9	212.112-M11	485	9	600-M10	713-M2
463	9	212.112-M12	213-M7	486	9	721-M1	832-M2
464	9	213-M8	221.1-M9 (cont)				

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